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The Victorian Naturalist

**The Magazine of the
FIELD NATURALISTS CLUB OF VICTORIA**

in which is incorporated
THE MICROSCOPICAL SOCIETY OF VICTORIA

Vol 87

January – December, 1970

Editor: G. M. WARD

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the **VICTORIAN NATURALIST**

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The Victorian Naturalist

Editor: G. M. Ward

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Female Wandering Albatross *Diomedea exulans* incubating at Half Moon Bay, Macquarie Island, 1965.
ANARE photo by Ken G. Simpson.

Notes on the Aborigines of the Stawell District*

By ALDO MASSOLA†

The most noteworthy physical feature of the Town of Stawell is Big Hill, rising as it does more than 200 feet above the township. The hill is rich in gold mining history, for it was there that the "Reefs", which contributed so largely to the 70,000 oz. average yearly gold output of the district was first discovered.

History relates that prior to this discovery the locality was known as Pleasant Creek, and that it formed part of the Congongella selection, first occupied by John Allen in 1841. This pioneer sold to a Dr. Blundell in 1844, and it was one of his shepherds, William McLaughlan, who in May 1853 first found gold at Pleasant Creek.

Further back in time the district was traversed by bands of Aborigines during their seasonal movements between the camps on the Wimmera River and the rich hunting grounds on the foothills of the Grampians, or when on their way to the ceremonies which must have been performed at the Black Range.

Big Hill must have then been an important landmark. Its native name was *Kobram*, meaning Head, but signifying Hill, Elevation, and it no doubt enabled the Aborigines to correctly choose their direction. It is doubtful, however, that they would have camped in its vicinity, unless by necessity. This was because "water was scarce and what was available was anything but good . . . and the country was covered by timber of little use for anything else but firewood and dwarf scrub of no value", as is described in the 1947 official Home to Stawell pub-

lication. Under those conditions the natives would find hunting difficult, and it is even probable that the district was regarded as a no-man's-land, and that it was a boundary between two groups of tribes.

The Black Range, which they called *Burrong*, and which strangely enough means Dark, Black, was also a boundary. In the case of this range, however, it seems that it was periodically visited by the tribes from the north, at least for the performance of certain religious ceremonies. This fact is evidenced by Bunjil's Cave, where there is the only known representation of Bunjil, the Great Man of many of the Victorian tribes. The locality must have belonged to, and the figure of Bunjil must have been painted by, members of the northern group, since the people of the south believed in another Great Man, or at least had another name for the same one. Also the art style of Bunjil's rendition differs greatly from that of all other known Grampian paintings, and it must therefore be assigned to a different art tradition.

There were probably other mythological features in and around the Black Range. That singular group of rocks known as the Sister Rocks, time weathered and impressive, until their stark and gaunt forms were made to look like Piccadilly Circus by vandals, could not have escaped the Aborigines' notice; nor could have Pan Rock, which dominates the flank of the range and is credited with reflecting the moon's light by an ethereal glow said to be visible for a distance of 30 miles. Unfortunately any legend or tradition connected with these features has been irrevocably lost.

* These notes formed part of a lecture delivered before the Stawell Historical Society and the Stawell Field Naturalists' Club on 20/8/69.

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On the Black Range, water was no problem; there are still dozens of springs scattered through the hills. One, on the eastern base of the range, was known to the natives as *Mit-cat-catchin*. I cannot work out the meaning of *Mit-cat*, but the second part of the name, *catchin*, is generic for "spring of water". It would be difficult to pin point this spring, since there are three large ones on the eastern base of the range — Fisher's, Ludwig's and McLean's — any one of which could well be *Mit-cat*.

Water was also available from two rock wells, one situated close to the summit of Flag Staff hill and the other near View Rock, on the eastern slopes of the range. They are both good examples of those natural reservoirs sometimes found in granite country. Impurities in the rock were softened and washed away by Nature, and the waterholding hollow thus formed was deepened by the ever observant Aborigines. Often, as in these two cases, the hole became the mouth of a vast amount of water collected under-

ground, the pressure of which causes it to rise to the opening in the rock. Aborigines were in the habit of keeping the mouth of these rock wells covered with a flat stone to prevent leaves and dirt, and animals, from falling in and thus polluting the water.

The names of most of the tribal groups around Stawell are known. To the north, the Wimmera River at about Glenorchy (*Djarrah*, a job, work) was the home of the *Murra-murra-barap*. Their nearest neighbours were the *Djappuninyou*, of the Richardson River, whose headquarters seem to have been on the site of Carr's Plains homestead. There was a large water-hole on the river close by, which, it has been recorded, they called *Engot-tenenurmworm*, a name that to me does not even sound Aboriginal, except that the ending *Wurm* does mean Shelter, therefore denoting a camping place. This large hole, said to have been about 20 feet deep, is now silted up through the building of a dam further down the river.



The Black Range from Big Hill, Stawell.

photo: Author

Both of these groups belonged to the *Muk-jarawaint*, one of the *Wot-jobaluk* tribes of the Wimmera and Mallee, and both certainly attended the great tribal gatherings at Lake Buloke at the end of the Richardson and Avon Rivers, and at Lake Wirren-gren, at the end of the Wimmera River system.

South and south-west of Kobram (Big Hill), the country was well watered and game was plentiful. Lake Lonsdale (*Djakil*, Pelican), Lake Fyans (*Martang*, the Hollow), Hall's Gap, and the watershed of Mt. William Creek belonged to the *Knindowurong*, a group of people which I find difficult to place within the *Wot-jobaluk*, as is claimed by some writers. The suffix *Wurong*, Lip, i.e. Speech, is common amongst the Western District tribes, and because of this I would make the *Knindowurong* a group of the *Tjapwurong* tribe, of which the next group to the east, centred at about Moyston, (*Jaraughi-djakil*, Pelican's Place) was the *Nutcheyong*. The *Tjapwurong* belonged to the *Mara* group of tribes.

There seems little doubt, however, that perfect amity existed between the northern and the southern people. It is even most probable that they traditionally exchanged sisters for wives, and that the northern people did take part at the great tribal gatherings of the southern tribes at Lake Bolac (*Boluk*, Swamp, and by anology Bullfrogs) during the eel season, and that they were frequent visitors at the large campsites on the sand cliffs on the northern shore and on the Sand Bar of Lake Lonsdale. Possibly there, they exchanged the produce and manufactures of their own country for stone axe-blanks which the *Knindowurong* quarried from the greenstone outcrops occurring amongst sandstone on the south-east and south-west flanks of Mt. Dryden, where there are accumulations of chips and flakes half-buried in the grass and soil, close to the protruding masses of greenstone, denoting where the axe-blanks were shaped. The *Knindowurong* also quarried this mineral (diabase) from another, but smaller outcrop, on the late Mr. Hate-ly's property, near Juluka.



Mt. Dryden (centre) from Lake Lonsdale campsite.

Grampians are to the right.

photo: Author

The way of life and the customs and beliefs of all these groups differed but slightly from that of the other tribes of south-west Victoria, any difference being dictated by local conditions of food and terrain, and not by mentality or race.

All these tribes were divided into two intermarrying classes and counted descent through the mother. A man did not generally have more than one wife, and she had to be from the opposite class to himself and preferably not from the same locality as his mother. No one had prior access to the wife, and strict fidelity was expected from her; nor was she ever lent to friends or visitors as was done amongst certain other tribes.

When deemed old enough the boys of the tribe were initiated, which meant that they were taken into the bush by some of the men and made to witness a number of ceremonies during which the earthly activities of the ancestral or totemic spirits and the traditions of the tribe were explained. The boys had also to submit to the painful rite of depilation, during

which every hair from the boys' face and body was plucked. The ceremonies terminated with a "smoking" over a fire made with green leaves. The boys were then ready to sit at the men's councils, where as yet, and for some time to come, they were not allowed to speak, only to listen and learn.

The dead were either buried, cremated, exposed on a rough platform constructed on a tree, or secreted in hollow trees. Their religious beliefs centred around a good spirit called Bunjil (Pirn-mehial by the southern tribes) who had made the earth and all upon it, and caused certain spirits to punish evil doers. When a man died his soul (*Kol-kon*) went to a happy land beyond the sky which was never short of water and where food was plentiful, and his spirit (*Gulkan-gulkan*) went to the totem centre, from which he looked out for a passing woman, whom he would enter, and having lodged in her womb was reincarnated.

The Aborigines had devised a system of life eminently suited to the environment. Their weapons and uten-

Native diabase quarry on S.-W. flank of Mt. Dryden.



photo: Author

sils were ingeniously made from available materials, such as stone, wood, reeds, and animal fur and bone. All that nature provided was utilized. Food was plentiful and varied; seeds and edible roots were collected and animals were speared, netted and trapped.

One of the few men who wrote of the Aborigines of the early period was C. B. Hall, of Hall's Gap. In letters from Victorian Pioneers he relates that he saw many signs of Aboriginal industry, and he remarked upon the numerous fish weirs made with sod banks extending across the shallows of the rivers, with apertures at intervals, at which were placed long, circular reed baskets, shaped like huge stockings, into which the fish piled. Heaps of mussel shells, remains of meals were abundant on the edges of the swamps, and old deserted miasmas were a common sight. Native tracks were clearly defined. One, about 15 miles north of Mt. William led to the sources of the Glenelg River. Further south many others were in evidence, denoting that the Grampians were crossed in all directions.

However, as happened in all other districts, the coming of the white man disrupted the traditional way of life. The white man occupied the most advantageous positions to build his huts; his sheep and cattle foraged upon the edible roots which were the main stay of the tribes; the kangaroos and other native game were shot because it was believed that they competed with the sheep for grass; the water holes were taken over, and the sacred grounds were not respected.

The tribes, who at first appeared to have accepted the coming of the white man, became troublesome and soon every station had some tragic tale to tell; hut keepers murdered, utensils and rations stolen, cattle speared or

driven off, and sheep slaughtered. But no settler admitted to the indiscriminate murdering of whole groups of men, women and children, or to the assaults perpetuated upon the persons of the unfortunate native women, many of whom were kept in a state of slavery.

Eventually the Aborigines accepted the inevitable. With their tribal territory and their tribal organization gone with most of their elders and able bodied men dead, with their women only giving birth to half castes; they gave up the struggle. Already by the mid-1850s many groups had become extinct, and the sad remnants of others spent their time pitifully wandering from station to town, often looking for bread and being given rum instead, for no better reason than for being amused at their drunken antics.

By 1863 the entire native population of the Richardson River, Lake Buloke, and Morton Plains was recorded at 52 men, women and children. In 1866 the last of the Fiery Creek group, Jimmy Ware, died, and the total remnants of the Mt. Sturgeon, Hopkins River, and Mt. Cole tribes were counted at 36 men, women and children. In that year remnants of tribes, from far and wide, amounting to 30 men and 26 women, gathered at Mt. Cole for a last corroboree. In reporting the event, the Ararat and Pleasant Creek Advertiser states that:

. . . somehow grog was supplied to them, and the friendly dance finished in a most discourteous distribution of blows and a free use of waddies. The assembled parties separated all the worse for their failure.

However, a second attempt at the corroboree was made. King Koonawarn and his consort, "Granny", accompanied by 7 or 8 retainers arrived at Ararat from Mortlake, on their way to either the Hopkins River or Opossum Gully, where 100 Aborigines

were expected to congregate. Unfortunately I cannot find any record that the corroboree was held. If it was, this would certainly be the last general gathering of the Western District tribes. King Koonawarn, or to give him his full name, Kaawirn Koonawarn, Hissing Swan, was one of the main informants of James Dawson, the only white man who took the trouble to record the way of life of the south-western tribes of Victoria.

Pathos is sometimes clearly seen in these early accounts. Such is the case of Peter, a powerful and fearless Aboriginal of the Moyston group. When under the influence he was feared by the people of that town; and the streets were cleared when he appeared. Four years of dissipation, however, reduced him from an athlete to a broken man, skulking about for drinks, shorn alike of strength and courage, and only concerned with evading the police.

Sensationalism, too, is occasionally met in the old records; but fortunately at least in the Ararat and Pleasant Creek Advertiser, this type of journalism is not frequent. In the 26 March, 1857 issue the following appears:

A few days since, a party of Wimmera Aborigines, fully equipped and in war costume descended upon the Richardson tribe at Carr's Plains and stole a beautiful lubra. The Wimmera coolie is a handsome man, but the Richardson tribe will, in accordance with immemorial custom, try to rescue the dusky one. Though not at all romantic, it is possible that a bottle of P.B. will settle the dispute.

The following letter to the Editor of the newspaper, which appeared in the 2 April issue, precludes any comments on my part as to the possibility of the above happening in 1867. The letter was from Holford H. Wettenhall, owner of Carr's Plains, of whom it may be said that he was one of the few settlers to treat the Aborigines



Johnny, "King" of Buninyong.

Reproduced photo. Author

like human beings, and to befriend them. The letter reads:

Your Glenorchy Correspondent seems to have a very romantic imagination, for in your issue of the 26th inst. I see an account of the Wimmera blacks having stolen a young and beautiful lubra from this place. Such, I beg to say, is completely erroneous. A few of the Wimmera blacks were here, and stayed several days, and had a corroboree with the Richardson ones and then returned. King Johnny taking a niece with him to visit an aged relative, and is to bring her back shortly. A few only of the Richardson tribe did not want her to go, but no theft was attempted. By inserting these few lines you will much oblige the blacks and myself.

King Johnny, who was the principal head man of the Lake Buloke group, died on 29 January, 1883 and was buried at the Donald cemetery. He therefore outlived by many years his Mt. Cole counterpart, King William, who died at Beaufort on 9 January, 1869.

Readers' Nature Notes and Queries

These columns are available for all members, young and old, to bring before others their own observations in nature. Correspondence may be sent to the Editor.

Those Glands on Wattles

Mr. A. J. Swaby sends on this report made in response to his earlier notes on wattles, *Vict. Nat.* 86 (7) (8).

Mr. C. Cane, Maffra, is an experienced keeper of bees and careful observer. He reports that bees in east Victoria where Sunshine Wattle abounds, collect the exudation from the glands and can turn it into honey. The eastern apiarists depend on that when growth is active.

That calls for closer notice in other localities. Are metropolitan bees unsophisticated?

Someone in wattle country may be interested in continued study of the relations between the plants, ants and bees. Does the sticky substance on upper leaves (phyllodes) of Varnish Wattle come from glands? Is it attractive to insects?

Wombat Note

Mrs. Ellen Lyndon sent in the following note which may prompt a reply.

A very sick and mangy wombat was seen beside the Promontory road through Yanakie Run on June 4th, soon after midday. The animal appeared to be quite blind with eyelids closed and almost cemented together. It was in very poor condition, its skin hanging in loose bald folds. It allowed itself to be stroked and discussed but when startled proved to be still fairly nimble and determined. In its efforts to climb up the road bank it fell helplessly and rolled over and over down the slope. However, it eventually climbed over and crossed the roadway as if heading in a definite direction. It is probably starving to death and it would have been a kindness to put it out of its misery. It is not unusual for mangle to sweep through the fox population and leave weak and dying animals, but it is news to me that wombats can be similarly affected.

Two Ants

By A. J. SWABY

On the Black Range, western Grampians, we frequently caused excitement among ants. They were a little smaller than the red meat ants that form large mounds and worn tracks. But they were black and did not form large colonies.

The most interesting feature was a change of colour on the hind-body when disturbed. Just as if two segments were parting a patch of yellow-grey showed up. Someone with a microscope may complete the story.

In 1962, a wet year, we found small black ants in nests on sedges just above water level in a swamp between Sheet of Water and Forest Lodge, Grampians.

How did they know the flood was coming and what the height would be? Or did they move the nests up as the water rose?

Several times since, search has not revealed any of the abovementioned ants.

Notes on Australian Pigmy-possums (*Cercartetus*, Phalangeridae, Marsupialia)

By N. A. WAKEFIELD*

ABSTRACT

Note is made of recently proposed revisions involving family and ordinal taxonomy of marsupials. Distributional data and questions of subspecific taxonomy of species of *Cercartetus* are discussed. Five nipples and a litter of five are recorded for *C. nanus*. Details are given of observations of captive specimens of *Cercartetus*, which indicate that dormancy is correlated with rainfall and availability of food, and it is suggested that this demonstrates an adaptive advantage of dormancy.

The validity of *Cercartetus* Gloger as the generic name for four species of Australian pigmy-possums was discussed previously in this journal (Wakefield, 1963).

CLASSIFICATION

In a classification of marsupials, based on serological studies, Kirsch (1968) proposes to exclude *Cercartetus* and certain other genera from the family Phalangeridae and to place them in the family Burramyidae. The title of this paper has retained the broader application of the name Phalangeridae.

In a classification proposed by Ride (1964), the name Marsupialia is given superordinal status, several orders of marsupials are recognized, and the family Phalangeridae is placed in the order Diprotodonta.

DISTRIBUTIONAL DATA

Cercartetus nanus

It was noted that O'Reilly (1940) mentioned the finding of a "dormouse possum" in the Macpherson Ranges, S.E. Queensland, and an enquiry to the Queensland Museum brought the following reply (A. Bartholomai, letter 21/5/1965):

The specimen mentioned in Bernard O'Reilly's *Green Mountains* has been located, labelled *Dromicia unicolor* and registered J5861. It is a female spirit specimen, and was obtained from Robert's Plateau, Lamington National Park, S.E. Q., donated by M. O'Reilly, on 7/1/1936.

The specimen was examined and its identity is *Cercartetus nanus*.

There is now a second example in the Queensland Museum (reg. no. J13580) from the same area. It was sent to the museum by David Fleay, and the date recorded, 9/2/1966, evidently refers to the registration and not to the original discovery. The specimen is a young adult female, with the M³s not fully erupted. The deeply bifid P⁴s establish the identity as *Cercartetus nanus*, although it had been reported in a newspaper (*The Courier Mail*, Brisbane, page 8, 18/1/1966) as being *Cercartetus caudatus*, the Long-tailed Pigmy-possum of N.E. Queensland.

The previously recognized most northerly occurrence of *C. nanus* was in the Newcastle area of New South Wales (Wakefield, 1963).

Green (1969) provides data of the occurrence of *C. nanus* on Flinders Island, Bass Strait.

* Biology Department, Monash Teachers' College, Clayton, Victoria.

Cercartetus concinnus

Bolam (1923) reports the finding of a specimen of *C. concinnus* at Fisher, about 50 miles west of Ooldea in the far south-west of South Australia. The locality is towards the middle of the 600-mile gap between the known ranges of the western and eastern races of the species (Wakefield, 1963), and it is in the mulga-saltbush vegetational association (ref. Wood and Williams, 1960), in which the species is not otherwise recorded.

Lundelius (1957) records remains of *C. concinnus*, of presumably Recent geological age, from Murraelellavan Cave, in the far south-east of Western Australia, approximately in the centre of the distributional gap between the two races. The cave is at about the limit of the vegetational formation identified by Wood and Williams (*loc. cit.*) as semi-arid mallee, a normal habitat of the species. The age of the cave remains has not been determined.

Cercartetus lepidus

A prepared skin and skull of *C. lepidus* was presented to the South Australian Museum (reg. no. M6338), and the donor reported that the specimen had been found, alive, on Kangaroo Island, South Australia (Aitken, 1967).

The local climate and the sclerophyll mallee vegetational formation of that island (ref. Wood and Williams, *loc. cit.*), make it extremely unlikely that an indigenous population of the species occurs there.

Cranial characters and teeth of M6338 have been measured and compared statistically with those of a series of modern Tasmanian specimens of *C. lepidus*. Ten probability values, obtained from T tests for eight linear dimensions and two proportions, all lay in the range 0.21 to 0.95. This suggests strongly that the Kangaroo

Island specimen belongs to the Tasmanian population.

Accidental transport of pigmy-possums

It has been reported that two specimens of *Cercartetus nanus* were inadvertently taken away, in packed clothing, from a seaside cottage at Tamboon Inlet, eastern Victoria, and that specimens of *C. concinnus* have been found secreted in farm machinery both in western Victoria and lower South Australia (Wakefield, 1963).

Green (1969) records the accidental transport of a specimen of *C. nanus* from Flinders Island in Bass Strait to Tasmania. It was found in a torpid condition when a recently shipped bag of wool was opened in a Launceston wool store.

Episodes of this kind indicate the possibility of accidental transport of a specimen or family of the Tasmanian *C. lepidus* to Kangaroo Island, thus providing the South Australian Museum specimen; and a similar explanation could apply to Bolam's specimen of *C. concinnus* at Fisher.

SUBSPECIFIC TAXONOMY

Cercartetus nanus

Wakefield (1963) suggested that a single mainland race, *C. nanus unicolor* (Kreffft), should be recognized, as distinct from the Tasmanian race, *C. nanus nanus* (Desmarest). This was based mainly on the consideration of geographical distribution.

Subsequent craniometric study of subfossil and modern series has demonstrated (a) that the mainland population is bimodal as regards size, with specimens from S.W., C. and N.E. Victoria smaller than those from E. Victoria and E. New South Wales, and (b) that the locally available Tasmanian cranial specimens (four in number) are insufficient to demon-

strate difference from or affinity with either of the mainland populations.

A suitably large series of Tasmanian specimens, and further study, are needed to resolve the matter.

Cercartetus concinnus

If there is a continuous distribution of this species from South Australia to Western Australia, as is suggested by Bolam's Fisher specimen (see above), or if further cave deposit data show that such distribution did occur in Recent times, then the distinguishing of the eastern Australian population as *C. concinnus minor* (Wakefield, 1963) must be questioned. In any case, proper statistical comparisons of adequate series from the two populations should be made.

Cercartetus lepidus

Measurements of the fossil specimens from Wombeyan Caves, New South Wales, and of the subfossil material from the Pyramids Cave, E. Victoria (ref. Wakefield, 1963), have not demonstrated any significant difference between this Australian Pleistocene population and the modern Tasmanian one. The Pleistocene material is too fragmentary for satisfactory diagnosis.

C. nanus WITH LITTER OF FIVE

On September 17, 1963, a female of *C. nanus* was found by D. Pepper near Mount Drummond, 15 miles west of Stawell, W. Victoria. With this species the normal number of nipples is four (Wakefield, 1963), but this specimen had a litter of five half-grown joeys. Examination of the pouch showed that she had five nipples.

Apart from the supernumerary nipple, this observation is of interest because the mother had produced more than the normal four pouch young. Small dasyurids (*Antechinus* spp. and others) have been found to

have about twice as many embryos *in utero* as there are nipples for their accommodation (P. Woolley, pers. comm.). This over-production of young is apparently an adaptation to offset possible loss of new-born individuals which do not succeed in reaching the nipple area. Evidently this applies also to *Cercartetus nanus*, and it may be general among small marsupials.

DORMANCY

Introduction

Hickman and Hickman (1960) record observations of dormancy made over a 12-month period with captive specimens of *Cercartetus nanus* and *C. lepidus*. Two females of each species were involved, and these results were obtained:

There was no prolonged hibernation; the longest period of dormancy was 12 days for *C. nanus* and 6 days for *C. lepidus*.

During full dormancy (also referred to as torpor), body temperature was about equal to air temperature, and, during arousal from torpor, that of *C. nanus* rose 31°C in 3 hours and that of *C. lepidus* 32°C in 2 hours 40 minutes.

Activity tended to be longer and dormancy shorter during the half-year September-February, and the reverse applied to the period March-August.

At temperatures between about 4°C and 18°C no direct correlation was apparent between temperature and the activity or dormancy. *C. nanus* was sometimes active at temperatures less than 2°C, but *C. lepidus* was not active when temperature was below 4°C. *C. nanus* was not dormant at temperatures above 18°C, and for the two specimens of *C. lepidus* the limit was 19°C and 15°C respectively.

There were individual differences in each species both in total number of

days of activity and in maximum duration of periods of activity.

Bartholomew and Hudson (1962) provide results of study of the physiology of *Cercartetus nanus*, including data of its metabolism during dormancy.

As well as reduction of body temperature during dormancy, breathing rate, oxygen consumption and heart rate were all much less. These authors remarked that, in laboratory conditions, dormancy was independent of season, time of day, environmental temperature, or availability of food. They found that any isolated and undisturbed animal sooner or later became dormant, that duration of dormancy was irregular, that dormancy tended to be most common during the early morning hours, and that, at temperatures below 15°C, some animals remained dormant for several days.

Food Availability and Dormancy

In winter 1962, at Noble Park, Victoria, observations were made of the dormancy, under various conditions, of three specimens of *Cercartetus concinnus* from the vicinity of the Little Desert, western Victoria. An adult male and an adult female (referred to as M1 and F1) were housed together in Cage 1 from June 2 to August 6, and another adult male (M2) was kept in Cage 2 from July 4 until August 6.

Food was supplied in the form of a honey-water mixture and cooked corn-meal-sugar-egg-milk custard. At certain times, all food was withheld for periods of 2 to 4 days.

Nest compartments associated with the cages had lids which allowed observation of the occupants with a minimum of disturbance. Record was kept of periods of activity and of dormancy, as far as these could be determined by frequent inspection.

Environmental temperature was recorded when inspection was made. Subsequently, rainfall records were obtained for weather stations at Springvale and Dandenong, and the daily falls were averaged to provide approximate data for Noble Park, which is situated between the two stations.

Table 1 shows details, for the 56 days, of availability of food in each box, periods of dormancy and activity of each specimen, and rainfall.

Specimen F1 provided an activity score totalling 39 days out of the 56. This was evidently excessive, for she remained in poor condition and eventually died. She was dormant for $8\frac{1}{2}$ of the 42 days (= 20%) when food was available, and for $8\frac{1}{2}$ of the 14 days (= 61%) when there was no food.

Specimen M1 was active for a total of $12\frac{1}{2}$ days of the 56. He remained in good condition, with considerable accumulation of subcutaneous fat. He was dormant for $31\frac{1}{2}$ days (= 75%) of the periods when food was available, and for 12 days (= 86%) of the periods when it was not.

Specimen M2 was active for an aggregate of only 3 days of the 34 days of observation in his case. His dormancy amounted to 26 of the 29 days (= 90%) when food was available, and for the whole of the 5-day period when it was not.

When combined, these three sets of data indicate dormancy for 58% of the periods when food was available to the respective individuals, and for 77% of the periods when food was not available. A similar analysis for the 38 days from June 12 to July 19 (to avoid complication with the very rainy phase of late July and early August), provides figures of 40% dormancy when food was available and 70% dormancy when it was not.

TABLE 1

Record of dormancy of *Cercartetus concinnus* in relation to food availability and rainfall.

Date (1962)	Box 1			Rainfall	Box 2	
	Food	F1	M1		Food	M2
June						
12		A	(D)			
13		A	D	18		
14		A	D	6		
15	N	A	D-A	1		
16	N	A	A	14		
17		A	A	9		
18		A	A			
19	N	A	D	16		
20	N	A	D-A	3		
21	N	D-A	D	3		
22		A	D			
23		A	D			
24		A	D	32		
25		A	D	23		
26		A	D			
27		A	D			
28		D-A	D-A			
29		A	A	27		
30		A	A	1		
July						
1	N	A-D	D	2		
2	N	D-A	D			
3		A	D	13		
4		A	D	2	D	
5		A	D-A		A	
6		A	A		A	
7		A	A		D	
8		A	D	2	D	
9		A	D-A		N	D
Date (1962)	Box 1			Rainfall	Box 2	
	Food	F1	M1		Food	M2
July						
10		A	D-A		N	D
11	N	D	D		N	D
12	N	D	D		N	D
13	N	D	D		N	D
14		A	(D)	4		D
15		A	D			D
16		A	A			D
17		A	A			D
18		A	D			A-D
19		A	(D)			D
20		A	D	7		D
21		A	D	17		D
22		(D)	D	5		(D)
23	N	(D)	D	127		D
24	N	D	D	55		D
25	N	D	D	3		D
26	N	D	D	21		D
27		A	(D)	1		D
28		A	D	1		D
29		A	D-A			D
30		D	D	11		D-A
31		D	D	8		D
Aug.						
1		D	D	73		(D)
2		D	D	4		D
3		D	D	19		D
4		D	D	10		D
5		D	D			D
6		A	D	3		D

Food—N indicates that none was available; otherwise it was present.

Rainfall—The record shown for each day is based on records for the 24-hour period to 9 a.m. the following day.

The state of each specimen is shown thus—A, active at each inspection for the day; D, dormant at each inspection; A-D, active at first, dormant later; D-A, dormant at first, active later; (D), dormant, but at some stage not fully torpid. (See text for key to individuals.)

Further correlation between dormancy and food availability is indicated by the fact that two periods (3 days and 2 days) of absence of food coincided with the initial stages of much longer periods of dormancy ($7\frac{1}{2}$ days and 5 days respectively) of specimen M1.

Rainfall and Dormancy

For days when rainfall was less than 6 points, the three specimens of *Cercartetus concinnus* produced a record of 59% dormancy and 41% activity. For days with rainfall in the 6 to 40 points range, dormancy was 63% and activity 37%. And for the three days when rainfall exceeded 50 points for a day, there was 100% dormancy.

The female *Cercartetus nanus* and her five joeys were observed from September 28 to October 18, and again from November 5 to November 9, 1963. During those times, honey-water and mealworms were continuously available to them. The environmental temperatures which were noted ranged from 46° to 68°F (9-20°C), and the possums were sometimes dormant at the higher limit. Except for a single occasion, when one individual was active and the others dormant, all six were either all active or all dormant whenever observed.

During the 21-day period, there were two phases of heavy rain: over 2 inches between 6 p.m. on September 28 and 9 a.m. on October 2, and approximately an inch from October 11 to 14. The remainder of the period was almost or quite fine. The possums were dormant throughout the first phase of rain and during almost all the second phase. They were active at all other times of inspection.

On November 5 they were found to be dormant and they remained so until about noon on November 8. This

dormancy was correlated with an aggregate of approximately 70 points of rain between November 2 and 7.

The cages housing the three specimens of *C. concinnus* and the family of *C. nanus* were kept during the periods of observation in the room of a house and thus were not in direct contact with the weather. The reaction of the animals to the occurrence of rain indicates that they were sensitive to the associated humidity.

Recovery from Torpor

On each of a number of occasions when specimens of *C. concinnus* were removed from their nest boxes and taken to a heated room for purposes of photography, the period of recovery from full torpor to full activity was approximately 30 minutes. Plate 1 comprises a series of ten photographs taken during one such period of recovery from torpor.

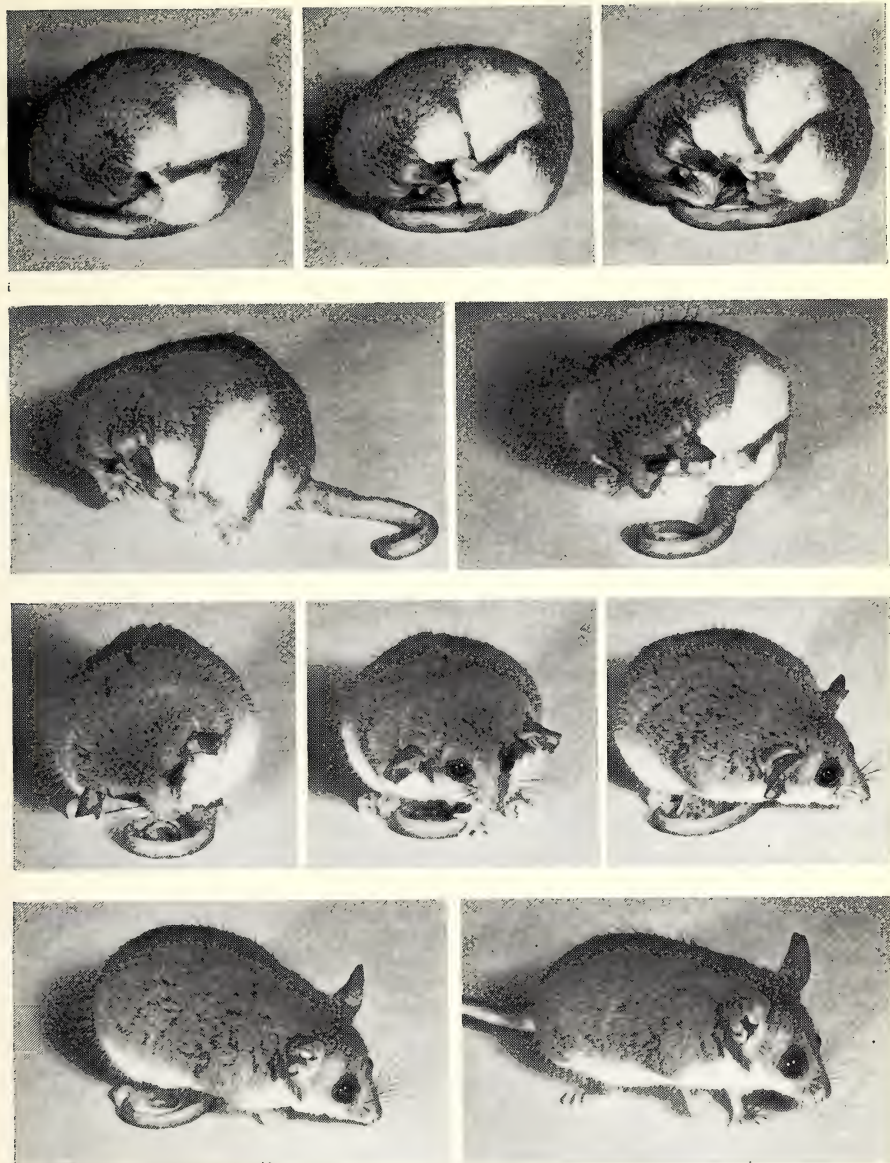
Conclusions

A positive correlation has been demonstrated, both with *Cercartetus concinnus* and *C. nanus*, between periods of dormancy and the occurrence of rain, and, with *C. concinnus*, between dormancy and non-availability of food. It is logical that such patterns should have evolved in response to the selective advantage of energy conservation when food cannot be obtained either because it is absent or because weather conditions prevent foraging.

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PLATE 1



Cercartetus concinnus: Recovery from Torpor

The sequence of ten photographs was taken over a period of approximately 30 minutes.

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Some Species of *Asterina* from Flinders, Victoria

By A. J. DARTNALL*

SUMMARY

Asterina atyphoida H. L. Clark and *Asterina scobinata* Livingstone are recorded from Flinders, Victoria.

Hermaphroditism of the latter species is recorded and the distribution of hermaphrodite species of asterinid sea stars considered.

Introduction

Twelve nominal species of the sea star genus *Asterina* are known from Australia (H. L. Clark, 1946). Three species are found on the south-eastern corner of the continent viz. *Asterina atyphoida* H. L. Clark, 1916; *Asterina inopinata* Livingstone, 1933 and *Asterina scobinata* Livingstone, 1933.

The size of sea stars is expressed by measuring the major radius (R) and the minor radius (r). The outline shape of the animal is expressed as a ratio R:r.

Asterina atyphoida H. L. Clark, 1916
Fig. 1

Arms five, pentagonal in shape. R:r = 1.3:1. Maximum R = 12 mm. Actinal intermediate plates usually with a single short blunt spine. Colour "pale cream, yellow or light brown", (Shepherd, 1968). The single specimen collected at Flinders was pale cream with a dark grey smudge at the centre of the disc. The specimen was female and the bright orange gonads showed through the oral surface. The gonopores are orientated orally.

Range: From the South Australian Gulf to Flinders, Victoria. Also recorded from Tasmania (Dartnall, 1969).

Asterina scobinata Livingstone, 1933.
Fig. 1.

Arms five; body stellate. R:r = 2:1. Maximum R = 15 mm. Actinal intermediate plates carrying groups of fine spines. Colour pale cream or light brown.

Range: The single specimen collected from the edge of the rock reef at Flinders constitutes the first record of this species from Victoria. Until then *Asterina scobinata* was known only from Tasmania.

Remarks: *Asterina scobinata* is secretive in its habits and is found under rocks and in crevices in the lower littoral zone. The type specimens of *A. scobinata* had five pairs of small, non-calcified spots in the actinal interradial areas (Livingstone, 1933). The presence of these spots was commented upon by H. L. Clark (1946) who wrote that they could "be made out with more or less difficulty" in the specimens available to him.

Twenty-three specimens from eight localities around Tasmania and one in Victoria (fig. 2) are held in the collections of the Tasmanian Museum. Four specimens are preserved in fluid fixatives, the remainder are dried specimens. The material to hand matched the original description in all pertinent characters except that pores, not spots, are present in the interradial.

Dissection revealed that the pores are orally orientated gonopores and that the species is hermaphrodite. Examination of the gonads showed subsequent sectioning of the gonads a preponderance of female tissue, the eggs being c. 0.3 mm. in diameter.

* Keeper of Invertebrates, The Tasmanian Museum, Hobart, Tasmania.

Male tissue was confined to a small area near to the base of the gonoduct. It would appear that, as in some other species of the Asterinidae, the ova are released to the substrate and are not pelagic.

Whether the territorial hermaphroditism observed is but one facet of a sexual polymorphism is unknown.

Little can be gained by temporal studies of the small amount of material available which was collected in January, March and June of different years. Difficulties of collecting and scarcity of material may preclude adequate investigation of the reproductive biology of *Asterina scobinata* for some time.

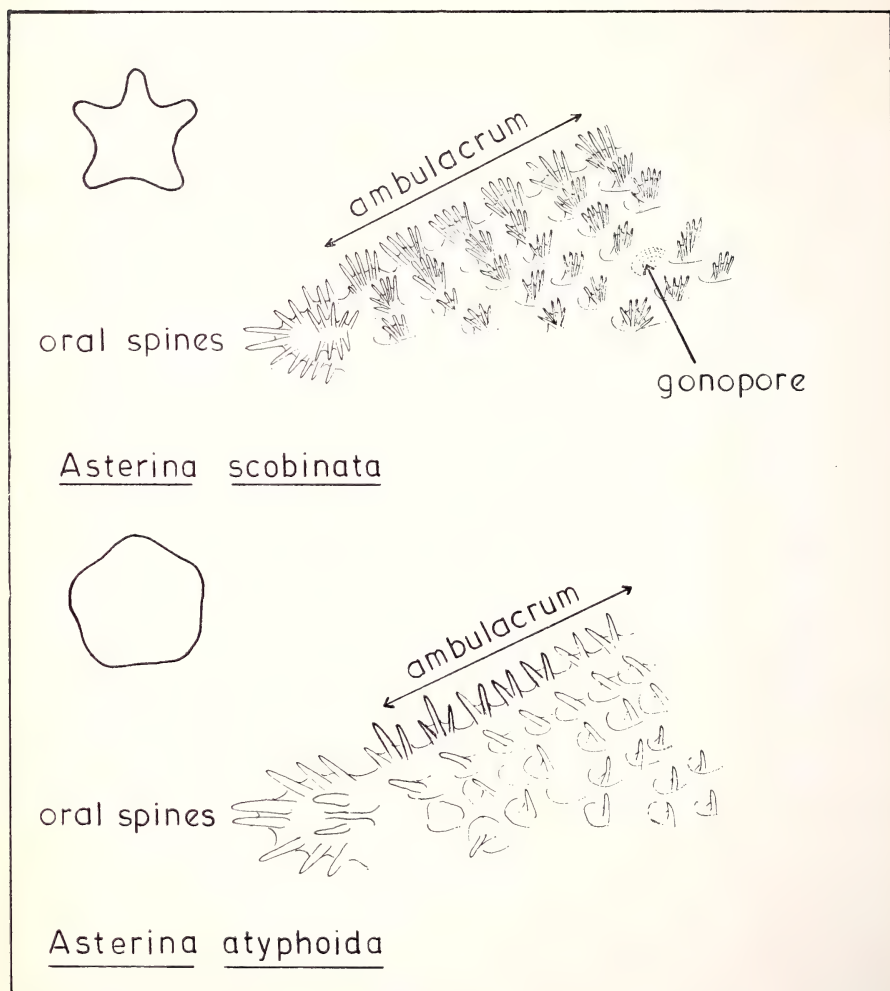


Fig. 1. Diagrammatic representations of body outline and spinulation of the actinal surface in *A. scobinata* and *A. atyphoida*.

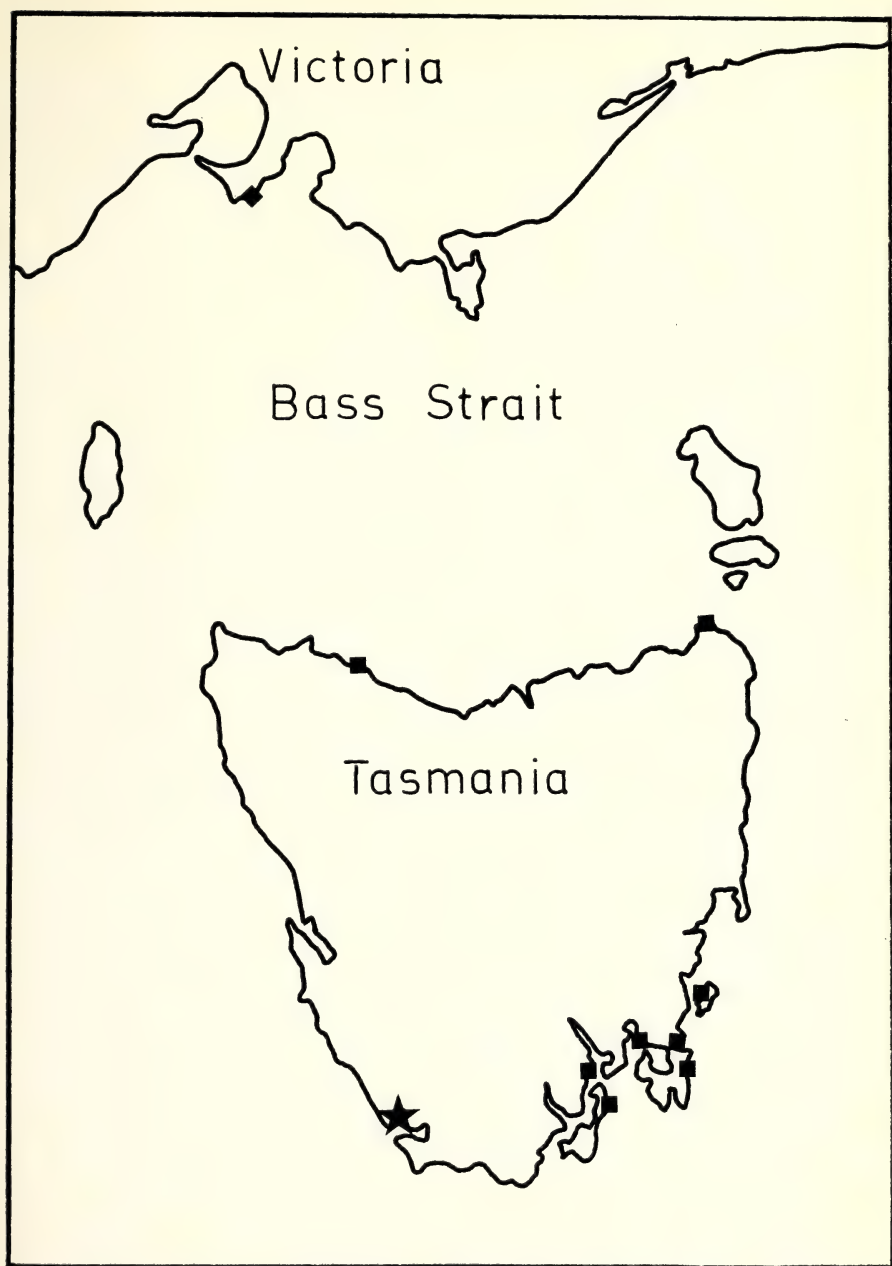


Fig. 2. Stations from which *A. scobinata* has been collected. The specimens from Port Davey, S.E. Tasmania (marked with a star) are held in the Queen Victoria Museum, Launceston, Tasmania.

Distribution of Hermaphrodite Species of Asterinidae.

Five species of the Asterinidae are known to be hermaphrodite and it is of interest to observe their distribution (fig. 3). *Asterina gibbosa* Pennant and *Asterina pancerii* Gasco are known from European waters, *Asterina bath-eri* Goto from Japan and *Asterina scobinata* and an hermaphrodite species of *Patiriella* are endemic to the Maugean Province of Australia. All have distributions in areas around 40° of latitude north or south. It remains to be seen if factors common to these areas could have resulted in the convergent evolution of hermaphrodite

forms or whether hermaphrodism is a primitive characteristic of species pushed outwards from a rapidly speciating pool of Indo-Pacific asterinid forms.

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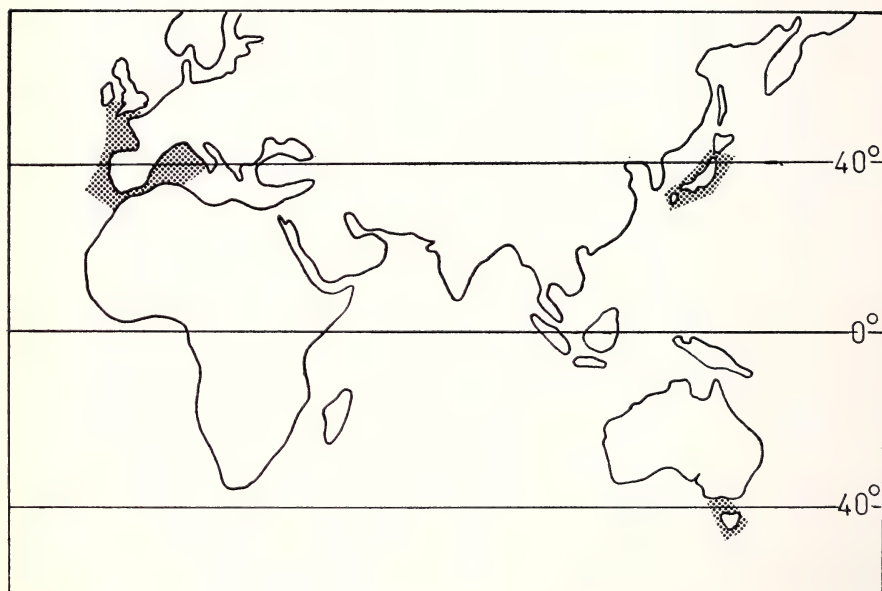


Fig. 3. Map to show distribution of hermaphrodite species of asterinid sea stars.

BOOK REVIEW

Birds of the New Zealand Shore

by BERNARD STONEHOUSE

Published by A. H. and A. W. Reed, Wellington, 1968. 12 pp. col. and b. and w. pll., and line drawings. \$4.95.

Shore birds carry a special appeal for both ornithologist and general naturalist. Dr. Stonehouse has compiled his list on the basis of "shore living species which breed on the main islands of New Zealand." In brief he includes Penguins, Shags (Cormorants), Gannet, Waders, Gulls, Skuas, Terns, Herons, and Spoonbills, but not necessarily all of each group. Rare waders and also marginal species "which raid the shore from time to time" are excluded. New Zealand ornithologists can safely be left to argue the case as to whether this or that species ought to be in or out.

As it is the book is both useful and attractive, the plates being generally excellent. The Penguin keys could be a little more precise about where crests begin, the name Egret could have been mentioned for the White Heron, it would have added perspective to have shown that some species occur as different races in Australia, e.g. Silver Gull and White Egret, and

the large line drawings are not always effective. Other minor criticisms of factual matter will be found elsewhere e.g. *N.Z. Listener*, 1 Aug., 1969, p. 27, *Emu* 69 (3).

Nevertheless the book provides an introduction to the ecology of a distinctive habitat and bird community, it assists the identification of waders, and it will help Australian readers to a better acquaintance with some N.Z. birds. On a quite different level it is interesting to note the injection of the companionable style of British nature writing, e.g. herons that "pose in silence like eccentric diplomats in an embassy fishpond" and gannets that flap "their long elegant wings with an unmistakable nonchalance", that avoids anthropomorphism only by a degree of sophistication. The contributions of British ornithologists to the Australasian scene during the past ten years are both varied and unfinished.

A. R. McEvey

Flowers and Plants of Victoria in Colour

Copies of this excellent book are still available, and of course would make a wonderful gift. They are obtainable from the F.N.C.V. Treasurer, Mr. D. McInnes.

EDITOR'S NOTE

Due to a combination of personal difficulties and industrial problems, I unfortunately omitted to include in the December issue of the *Vict. Nat.*, any mention of thanks or seasonal wishes to contributors and readers. I therefore now thank 1969 contributors, and on behalf of Council, express the hope that a measure of peacefulness and rest existed within your lives over Christmas; and that your hopes and ideals are accomplished during 1970.

Field Naturalists Club of Victoria

General Meeting, 8 December, 1969

Approximately two hundred members attended and the meeting was Chaired by Mr. T. Sault, the Vice-President.

An apology was received from the President, Mr. E. R. Allan.

The minutes of the last meeting were taken as read on the motion of Mr. J. Strong and Mr. F. Zirkler.

Three new members who are listed in the December Naturalist were elected on the Motion of Miss M. Allender and Mr. A. J. Swaby. The Chairman announced that Council had approved the spending of from \$750-\$1,000 on the publication of Mr. Roy Wheeler's book "Birds of the Dandenongs".

It was announced that Mr. Charles A. Gardiner who has been awarded the Natural History Medallion is very ill in hospital. It has been decided to send the Medallion to Perth for presentation to him in hospital.

The Secretary has received a letter from the Bendigo Council saying that they will support any action the Club is contemplating on getting the Whipstick made a National Park.

Copies of the Victorian National Park project for 2,000 sq. miles of the Victorian Alps were available at the meeting.

The Secretary announced that a Christmas Card has been received from Mr. and Mrs. R. Hudson in England. Mr. Hudson was a former editor of the Naturalist and is still a member of the Club. The thanks and good wishes of the Club are extended to Mr. and Mrs. Hudson.

The Secretary had been contacted by the Bend of Islands Conserva-

tion Society regarding the unnecessary destruction of natural bushland in that area due to the overall authority of the "Proper Officer" for clearance of fire hazards. Some properties had suffered destruction by bulldozing beneath the top soil. The Secretary, Mr. D. Lee, sent a letter and a telegram to the Healesville Council in time for a meeting at which the Bend of Islands Conservation Society would be present. He has had no reply.

The subject of the evening was the "Club Excursion to Western Australia, August 1969".

Many of the members provided slides taken on the excursion and the commentary was given by Mrs. E. King who traced on a projected map the route taken. The party went by train and before reaching Adelaide got off at Bridge-water, where Mr. Bill Gasking showed the party around the Cleland Native Fauna Reserve where native animals are kept in surroundings as free and natural as possible. Pictures showed Emus with chicks, water birds and several kinds of marsupials.

En route to Perth along the Nullarbor Plain, telegraph poles harbored nests. From Perth the party went by bus to Yanchep, to Jurien Bay, then through Geraldton to Coorow, Carnama and Three Springs to Northampton and Kalbarri National Park, and the Murchison River.

From Northampton the route was back to Geraldton and then inland to East Yuna and through Mullewa to Wongan Hills, Merredin, Hyden, Lake Grace, the Stirling Range, Poronguraps, Pallinup River, Albany, Manjimup, Pemberton, Busselton, Port Augusta, Cape Leeuwin and back to Perth — a

total of 2,250 miles by bus. From Perth the M.V. "Katameraire" took the party to Rottnest Island for the day, and on the last day in Perth, King's Park was visited before returning by train. Beautiful slides showed masses of flowers in natural gardens and on roadsides including purple Hovea, pink Calythrix, smoke bushes, rosettes of trigger plants, grass trees, golden Acacias and Synophea, red Calothamnus, blue, red, and yellow and red Leschenaultias, golden Hibbertias, cream and yellow Conostylis, lilac Hemiantra, blue-violet Thysanotus, white Stenopetalum and Stackhousia, red and yellow Catspaw—Anigosanthos, and black and yellow Kangaroo paw—Macropodia—Salmon gums made fine pictures. When the bus driver was investigating a roadside car accident outside Jurien Bay, an oncoming car put the bus out of order by puncturing the fuel tank.

The four hour wait was used in investigating the area where the magnificent red *Verticordia grandis* appeared. Outside Three Springs a talc open-cut mine was photographed. At Strawberry Bridge *Brachysema aphyllum* was first seen, and near Geraldton the famous leaning Greenough Eucalypt trees appeared. From Northhampton the Kalbarri National Park and the Ross Graham lookout over the Murchison River provided magnificent pictures of gorge and Red Bluff and native plants including Golden *Loudonia aurea*, red and green Kangaroo paw—*Anigosanthos manglesii* in masses on burnt out areas, Lamb's tail *Lachnostachys eriobotrya*, Grevilleas, Hakeas, Melaleucas, Isopogons, Petrophilas, numerous Acacias, the pine like *Actinostrobus*, lilac *Hibiscus huegelii*, yellow Labichea, pink *Verticordia*, many pink-mauve *Paeckea* or *Scholtzia* patches and bright *Parakeelia* near the Murchison River where Coolibah trees occurred. A *Moloch horridus* lizard was found at Kalbarri. At East Yuna after lunch under the York gums where a stumpy tail lizard co-operated with the photographers, Mr. and Miss McGauran took the party to their bush land and showed many native plants, the highlight being the scarlet Balaustion (native pomegranate). From the Mullewa area fields of yellow, pink, and white and orange everlasting types were shown.

Huge portable wheat storages dominated many inland towns in the wheat area. Masses of blue *Dampiera*, varying from pale blue to purple, royal *Scaevola*, *Thomasia*, *Melaleucas*, *Hakea bucculenta*

and *H. multilineata*, wreath *Leschenaultia*, Gimlet gums, and a fruiting *Quandong* were photographed.

The celebrated Wave Rock near Hyden was shown from various angles, up, down, and sideways.

On the way to Stirling Range, flowering Mallees were common and also miles of Acacias of many species. At the foot of Bluff Knob, the bus jibbed on a hill, but was ultimately towed up by a road making machine secured by the efforts of Evelyn Jones and Anne Forbes.

The pictures of the Stirlings included *Banksia grandis* in flower and fruit, *Beaufortia*, *Dryandras*, *Isopogons*, *Petrophilas* and *Darwinia leiostyla*.

In the Porongurups, Karri and purple Hovea were prominent. Red *Banksia coccinea*, red *Leschenaultia* and the "Albany daisy" *Actinodium cunninghamii* made beautiful pictures, and orchids included hammer, elbow, spider, jug, donkey, cowslip, and pink fairy orchids.

At Albany pictures from Frenchman's Bay included *Anthocercis* (Ray flower), *Xanthosia* (Southern Cross).

After lunch in Mr. Fell's garden, the party went by bus to Mr. Lockharts property on an introduction from Mr. Fell. Here pictures of the pitcher plant and the brown boronia and a red *Adenanthos* growing in a swamp were taken. At Manjimup a small native reserve showed black swans and a nesting galah.

Near Pemberton is the famous Gloucester Karri tree with a fire watch cabin 212 ft. up. Giant Karri and Jarrah trees. *Clematis pubescens*, *Leucopogon verticillata*, yellow *Patersonia xanthina*, *Kingia* grass trees showing round knobs of flowering shoots were shown.

From Busselton were views of the old St. Mary's Church and the first train (made in Ballarat) to run in West Australia.

Other scenes were of the Margaret River Jewel Cave, the lighthouse at Cape Leeuwin where pink *Pimelea ferruginea* bloomed. Along the road were masses of coral coloured *Kennedyia coccinea*.

Near Bunbury an open cut ilmenite mine was viewed, and at Dawesville on Peel Inlet three photogenic pelicans posed on a post.

White *Agonis flexuosa* in full bloom, mauve *Olearia rudis* and at a reserve outside Perth the pink Swan River myrtle were seen.

Lake Bibra, a wild fowl refuge, showed many water birds among the paper bark trees. A visit to Rottnest Island showed quokkas being fed after responding to the call of the bus horn.

Mr. Sault thanked Mrs. King for the commentary and Mr. Alan Morrison for projecting the slides.

Members showed enthusiastic appreciation.

Nature Notes

Mr. D. McInnes said that the Club excursion on Sunday, 7 December, included a visit to the 200 acre Nature Reserve from Cuthbertson's property off Grubb Road near Ocean Grove. (A note on the history and birds and plants of the reserve will be included separately.)

Mr. McInnes showed two small polychaete worms under the microscope; one a spirorbis and the other surrounded by a sandy tube. These were from Point Lonsdale. Mrs. E. Bennett brought some duck orchids (*Caleana major*) growing in a pot. They had been in flower since 11 November.

Mr. A. J. Swaby said the flowers often stay out to be pollinated by *Lissoplumpia semipunctata* and remain open if they are not. This insect does live near Mrs. Bennetts' Sandringham home.

Mr. Swaby brought garden grown native plants in flower including *Sollya fusiformis* (W.A.), *Melaleuca hypericifolia*, *Prostanthera lasianthos*, *Leptospermum ericoides*, *Calothamnus quadrifida*, *Haloragis micrantha* and also the flattened stem of *Homalocladium platycladium* from which a rare leaf came out. He also showed a large larva of a Wattle goat moth (*Xylentes d'urvillei*) the boring by which species killed a wattle tree. Mr. H. Bishop showed under a binocular microscope, a hydroid (*Claratella prolifera*) with 6 arms, each with two parts, one a suction pad to grip for locomotion, and one with stinging cells for capturing prey such as Crustaceans. Some of this material from Mr. Bishop's tank has been sent by Mrs. Jan Watson to the Emperor of Japan who is a famous marine biologist. Mr. Ros Garnet brought a fine flowering *Cymbidium canaliculatum*—an epiphyte on

many kinds of host trees in Queensland, including iron bark and smooth bark Eucalypts and Casuarinas. Sugar exudes from this plant at the axils of the flower pedicels.

Miss M. Allender showed the West Australian Pitcher plant *Cephalotus follicularis* which was gathered in W.A. in 1963.

Mr. T. Sault brought *Alyxia buxifolia* (Sea box) with white perfumed flowers and berries forming.

Mr. A. Fairhall showed an unusual formation of *Calothamnus quadrifidus* with a long length of flowers growing evenly around the stem of this so called "one-sided bottle brush".

Marine Biology and Entomology Group
Report, 1 December, 1969.

This Meeting was Chaired by Mr. R. Condron, 15 members being in attendance.

The Secretary announced that as usual there would be no meeting in January. Prior to the Group changing their meeting place to the National Museum early in the New Year, the Secretary is to ascertain what parking facilities for cars are available.

There will be a F.N.C.V. outing to the Sorrento area on 15 February, 1970, as there is low water at 2.22 p.m. on that day.

Mrs. Zillah Lee showed some beautiful slides taken on various F.N.C.V. trips including areas around Binna Burra, Queensland, her photography being up to its usual high standard. Mrs. Lee gave a short talk on each slide, and members thoroughly enjoyed this part of the evening.

Exhibits:—

Mr. Bishop showed a species of hydroid taken from his marine tank. He gave a short talk on this interesting little Coelenterate.

Mr. McInnes showed beetles collected in the Brisbane Ranges area by the Hawthorn Juniors on an excursion led by Mr. P. Kelly. Also a species of water boatman (back-swimmer), under a Club microscope, and gave a short talk on this. Mr. R. Condron showed some Lycaenidae family butterflies which he had bred out, also some pupae of family Hesperidae.

F.N.C.V. DIARY OF COMING EVENTS

GENERAL MEETINGS

Monday, 12 January—At National Herbarium, The Domain, South Yarra, commencing at 8 p.m.

1. Minutes, Reports, Announcements.
2. Correspondence.
3. Subject for the evening—Members' Night.
4. General Business.
5. Nature Notes and Exhibits.

Monday, 9 February—"Through the Kimberleys": Mr. Alan Morrison.

F.N.C.V. Excursions

Sunday, 18 January—Cumberland Falls. The coach will leave Batman Avenue at 9.30 a.m. Bookings with the excursion secretary. Fare \$2.00. Bring two meals.

Sunday, 15 February—Marine Biology Excursion to Sorrento area.

GROUP MEETINGS

(8 p.m. at National Herbarium unless otherwise stated)

Wednesday, 21 January—Microscopical Group.

Monday, 2 February—Entomology & Marine Biology Group Meeting. This Group will now meet at the National Museum, Russell Street, Melbourne.

Wednesday, 4 February—Geology Group.

Thursday, 5 February—All future meetings of the Mammal Survey Group will be held on the first Thursday of every month, in the Seminar Room (Ground floor), Sir Arthur Rylah Institute for Environmental Research, Cnr. Brown Street and Stradbroke Avenue, Heidelberg.

Thursday, 12 February—Botany Group. Advance notice of an identification night of Western Australian wildflower slides. Will members with good, correctly identified slides bring a selection to be shown first, so anyone with slides of the same plant can name them, if time is left these will be followed by un-named slides and an attempt will be made to identify them. Please bring any books which may be helpful.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.

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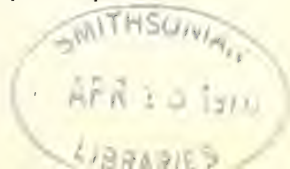
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The Victorian Naturalist

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Front Cover:

The pelican in pensive mood was photographed by the Editor at Sir Colin MacKenzie Sanctuary.

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T. S. Hall Memorial Lecture

The Life of the Present and the Life of the Past

By EDMUND D. GILL*

Dr. T. S. Hall studied both the life of the present and the life of the past for he was both a biologist and palaeobiologist, a teacher of zoology and a research worker in fossils. Life is a continuum, so the life of the present and the life of the past are one. To separate these is an error that seems to have arisen largely out of the severe specialization that the increase of knowledge has forced upon us. Hall took the broad view of life. He studied the extinct graptolites of hundreds of millions of years ago, the Cainozoic mollusca that lead to those presently living, and studied also many forms of living things. For him life was one and indivisible, a philosophy that lies behind "Biological Science: the Web of Life", the book published in 1967 by the Australian Academy of Science.

Career of T. S. Hall

But let us go back to the beginning of this story. Born in 1858, T. S. Hall was a Geelong boy who did well at school, gaining exhibitions to Ormond College in the University of Melbourne. He took a B.A. with honours in Natural Science in 1885, and a D.Sc. in 1908 when he was 50. The zoology course in the 1880s was no different in principle from that which Charles Darwin did at Cambridge, but the content was greater due to the advances in knowledge between those times. It contrasts strongly with the course of today, which includes evolution and whole new sciences such as genetics and ecology. After a brief time as a teacher at Bendigo, Hall returned to the University, then

from 1890-1893 was Director of the Castlemaine School of Mines. I imagine that it was here that he developed his interest in graptolites because they were so important for the gold mining then in its strength, and because there were so many well preserved specimens to be collected in that area. In 1893 Hall succeeded Dr. Dendy as lecturer in biology. Round about the change of the century was a time when many famous men held chairs in the University of Melbourne — Baldwin Spencer in natural science, Lyell in natural philosophy, Masson in chemistry, and Ewart in botany.

By his training and experience, Hall had a wide interest and considerable competence in natural history as a whole, because the time had not come when specialization was important. The many different kinds of taxa that he described, and were named after him because he had collected them, demonstrate clearly his real interest in both the life of the present and the life of the past. But in his own researches he kept mostly to palaeontology.

Hall took an interest in the Australian Association for the Advancement of Science and in the Field Naturalists' Club (which in those days had active support and leadership from the University), but especially in the Royal Society of Victoria of which he became a Council member at 38 (1896), then Librarian, and for 15 years (1899-1914) was Honorary Secretary. In 1914 and 1915 he was President, but failing health and strength prevented him doing what he wished. He died in 1916.

* National Museum of Victoria.

Something of Hall's mental odyssey with respect to research can be followed by his succession of papers published in the Proceedings of the Royal Society of Victoria. They total 37, of which about one third (12) were in co-operation with other authors, generally Dr. G. B. Pritchard (10 papers).

His first effort was on Ordovician sponges published in 1889, which was after he had been a teacher at Bendigo (Ordovician gold country) and before he went to Castlemaine (the same type of country). Next came a paper in 1892 on graptolites, on which group he wrote nine papers. In the same year G. B. Pritchard wrote a paper on these organisms. In 1893 Hall wrote on some Tertiary fossils and soon after Pritchard did so too. Later Hall and Pritchard co-operated in publishing 10 papers on Tertiary formations. Hall's great breadth of interest is proved by the fact that he described fossil worms, sponges, polyzoa, corals, molluscs, echinoderms, crustacea, fish, whales and marsupials. In 1897, in co-operation with Professor Baldwin Spencer as senior author, Hall published his only paper in the *Proceedings* that dealt with living forms (isopods). Hall also wrote many articles for the *Victorian Naturalist*. They deal with a remarkable variety of subjects — the Buchan Caves, echinoids, eels, lizards, fish, biological nomenclature, glacial beds, musical sands, and many others. Hall gave lectures to the Field Naturalists' Club and led excursions for them. For example, he conducted an excursion to Mt. William to see the aboriginal axe-stone quarry. It helps us to visualize the very different conditions then, when we read that some excursionists went by train to Lancefield the night before, while others "dared the discomforts of the early morning suburban trains" (steam),

then caught a country train to Lancefield, arriving at the starting point of the excursion feeling "they had already spent a long day". That evening, after the main party had returned to Melbourne, Hall and Armitage stayed at a local farmhouse, then the next morning went looking for graptolites. In the afternoon they climbed to the top of Mt. William, returning in the evening so as to be ready to start work on Monday morning. That was in 1908 when Hall was 50. In the *Argus* he wrote a series of "geological rambles". These were widely appreciated, and so were supplemented and published as "Victorian Hill and Dale." Most of Hall's teaching was neontological, while most of his research was palaeontological. He thus dealt with the life of the present and the life of the past. Hall's work gained the attention of the Geological Society of London, which was a real honour for a "mere colonial".

Effect of Evolution

The year after Hall was born, Charles Darwin published "The Origin of Species" and Hall's life was lived in the turmoil that resulted from this vastly different explanation of the origin of the various kinds of life. It was a completely new interpretation of the relationship of the life of the present to the life of the past. Some accepted the new theory, some rejected it, and some tried to make a compromise by saying that evolution may apply to all taxa except man himself, and that some new principle was needed to account for man, the only self-conscious organism. Here was an effort to break the continuity between the life of the past and the life of the present. Darwin in his own quiet way expressed the confidence that the gap would be filled, but did not debate it. He possessed a gentlemanly sensitivity with respect to people's feelings and convic-

tions. He did not indulge in mental confrontation as did some of his supporters. However, the fill-gap came to be popularly known as the "Missing Link".

It was not till long after Hall had died that Darwin's prophecy came true. The "Missing Link" was discovered in the Australopithecines of South Africa. Indeed, so truly intermediate was this subfamily between the ancestors of the apes and present man that the experts argued for 25 years as to whether *Australopithecus* belonged to the Pongidae (apes) or the Hominidae (men). The genus is now definitely in the Hominidae. Dr. K. P. Oakley suggested that until the anatomical detail has been worked we can think of Man as the Toolmaker (not just tool user, because many animals from ants to apes will take a stone and use it). Man alone *makes* tools.

When the evolutionary idea took hold, there was a reaction against pedestal-building for man so common in Victorian times. Man was debunked. He was thought of in terms of his physical origins, and was regarded simply as the better beast. It is interesting to note that within a century the wheel turned a full round, for a few years ago Sir Julian Huxley, in an article in *Nature*, set up a new Kingdom called the Psychozoa for man alone. He claimed that there should be three Kingdoms — Plants, Animals and Psychozoans, the last containing man only.

In the meantime hundreds of fossil men had been found. It was discovered that man was far more varied in the past than now. At present there is only one genus with one species, but in the past there were at least three genera (in the modern sense) and quite a number of species. There has been a remarkable impoverishment in

the human family. So Darwin's prophecy appeared to have been vindicated, and the gap between the life of the past and the life of the present along the human line had been filled.

But many scientists were still unhappy because there seemed to be too much change for the amount of time available. If all this were true, then man had an accelerated evolutionary rate, far exceeding that of other forms of life. Ingenious explanations were offered to account for this phenomenon, but the problem has been solved. Radioactive dating has shown that there is far more time than anyone at first contemplated. The human family has been on earth for some 2,000,000 years.

In the Olduvai Gorge in East Africa there exists the most complete history of man yet discovered. The layers of rock exposed in the Gorge are the leaves of this history book, and the story is there for all who will to read. Looking through the pages one can see the changing faunas — the evolution of the fauna that inhabits the country now — but associated with these remains are those of man. There is an inbuilt timepiece in this history book — the volcanic rocks whose radioactive minerals can be assayed by the potassium-argon method and so the time calculated. The lowest bed with evidence of man is 1.75 million years, which is obviously not the beginning of the story, so we can say in round figures that man has been on the earth for something like 2,000,000 years. This dating is so important that laboratories all over the world have checked it. The fossil evidence is so critical that the best scientists in this field have checked it. This is one of the outstanding discoveries of our century — that man was once quite varied with different species to suit different environments, and also that

man has been on the earth far longer than anyone had dreamed — some two million years.

The new idea of evolution was so revolutionary that it led to a certain imbalance in thinking. Through a misunderstanding of the principle of natural selection there grew up the *laissez faire* policies in economics. The argument was that Nature is "all red in tooth and claw". Unbridled competition is the natural law it was claimed. This led to excesses that obviously needed correction, and modern economic policies no longer use the *laissez faire* principle. There is a good deal of control and protection both nationally and internationally. Another result of thinking of man as merely the better beast was a crop of behaviourist and similar philosophies in the field of psychology. In some of these interpretations man tended to become an automaton, and so with much less responsibility for his actions. We hope that our views are more balanced now, but they have not returned to the outlook of Hall's day. Man was then thought of as tripartite, having "body, soul and spirit", but nowadays the unity of man is stressed. Man is the self-conscious species, that can foresee, and with memory recall the past. With this range of vision, he sets standards for himself and takes responsibility. He is the ethical animal. However, with the understanding of the fundamental genetic and biochemical make-up of man, there comes the idea of control of inheritance and possibilities are opening up of which the wildest thinker never dreamed in times past. So the gap that existed between the life of the present and the life of the past in Hall's day has been filled, and there are completely new possibilities in the life of the future.

History is change plotted against time, and the discovery of radioactive dating has put perspective into the

history of man. Archaeological discoveries indicate that man has been a city dweller far longer than previously envisaged — some 10,000 years. New problems arose when instead of small hunter-collector groups there were large numbers in confined spaces. Gradually man organized himself until now he has become the most gregarious vertebrate of all with as many as 10,000,000 people in the one city. Variants that would not survive in the wild, survive in the protection and medical care of the city, so that man is gradually becoming different. As primary industry employs fewer and fewer people, because of machines, secondary industry employs more and more because of the sophistication of secondary products. Thus more and more people come to the cities, and because that is where the market is, more and more industries go there. So the countryside is being de-populated and civilized people are becoming predominantly city dwellers. They are becoming more and more divorced from their natural environment. This has gone so far that in Chicago they have a zoo where children can see what a horse, a cow and a sheep look like. In the Science Museum in Denver a blacksmith gives a daily demonstration of how in the olden days shoes were put on a horse. So the life of the present is becoming more and more different from the life of the past, not because evolution has gone off in a new direction but because man has determined the direction of his development, and society evolution has become more important than physical evolution. I believe that we will never succeed if we go against natural laws, and therefore for the life of the present and the future we should make a closer study of biology. This lecture is a tribute to one who appreciated the importance of biology for man in understanding himself and his environment.

Gliders of the Porepunkah District

By CLYDE O'DONNELL

The Greater Glider (*Schoinobates volans*), is to me, the most majestic and graceful of all the phalangers. As they are quite plentiful in my home area, I have taken the opportunity to study in detail, and with pleasure, their natural habits. North-eastern Victoria is an excellent locality for the Greater Glider, especially in the south of the region. However as most of my surveys have been carried out in the Upper Ovens Valley, I have not accounted for habit variations elsewhere. The township of Porepunkah is situated in this valley, surrounded by some of the most rugged mountains in Victoria. Extending from the foothills to the west, the granite formed slopes of Mt. Buffalo rise steeply towards the plateau. The Mt. Porepunkah range forms the northern slope which rises to some 4,000 feet. Although pine plantations are gradually expanding over the eastern and southern areas, there is still plenty of natural forest land. The natural forest consists mainly of ten species of Eucalypt, including Snow Gum and Woollybutt on Mts. Buffalo and Porepunkah.

The majority of the glider population is found in the Peppermints of the mountain slopes and the Eurabbie (*E. bicostata*) stands of the gullies.

While most of my experience was gained in the field, many interesting facts were learnt from captive specimens which were brought to me by forest workers. In such cases the animal was either orphaned or injured when its home was destroyed during clearing operations in the bush. When the glider became independent, it was released, either among Peppermints on our property, or in a

nearby gully where *E. bicostata* flourishes.

One evening in October of 1967, I set off on a routine glider survey, accompanied by my fellow naturalist, Raymond Carlson from the neighbouring town of Wandiligong. After carrying the equipment necessary for observations for nearly two miles into the bush, we stopped amidst a group of aging Eurabbies (*E. bicostata*). Here we made preparations for the fast approaching night by setting up a tape recorder, and selecting spotlighting positions. As well as our six-volt flashlights, Ray carried a pair of binoculars while I used a small field telescope to gain a more detailed view of the gliders. Our preparations complete, we waited eagerly. As the twilight faded, a male South-eastern Ring-tail (*Pseudocheirus laniginosus*) was the first to make an appearance. A few minutes later, the female of the species appeared nearby with a rufous coloured youngster clinging to her back. The silence of the bush was broken by the usual whispering conversation.

After listening to "Mopoke" some thirty times, a Greater Glider made a sudden appearance on the trunk of a nearby Narrow-leaved Peppermint (*E. radiata*). Hoping to discover its sleeping apartment, I moved in closer, directing my spotlight on to the hollow limbs of an old eucalypt nearby.

I was surprised to see instead, many tiny pairs of eyes belonging to the elusive Feather-tail Gliders (*Acrobates pygmaeus*) assembled at the entrance of their piped limb home. These tiny creatures measuring a mere four inches from head to tail tip, each in turn spanned the distance of about

fifteen feet in prolonged leaps to the nearest tree. As they were smaller than a single leaf they soon disappeared amidst the foliage. Two more Greater Gliders were sighted, so our attention was turned to them once more. One of the two gliders, a female, climbed high in its nest tree to munch gum tips, and here it was soon joined by the first glider we had spotted. The third animal glided off into the darkness with us in pursuit. The glider, in four successive volplanes, covered a distance of 220 yards before joining its mate for a quick snack of Manna Gum (*E. viminalis*) foliage tips. We later found a four month old young in the females possession. However, it did not leave the nest hollow before 11.30 that night.

Only the males appear to make their routine glides in this season, during which the female carries her young in the pouch. As a means of travel, the female usually makes large leaps and occasionally a very short glide. This is very likely because the young would otherwise be crushed on impact of the mother's landing. At the age of four months, the young which is still in the suckling stage, may often be found alone at the entrance of its nest hollow at night; however the parents are seldom far away. This may be an instinctive method adopted by the parents to encourage the young in gaining self confidence.

On this particular occasion the female ventured no more than 100 yards from the nest, and spent the first one and a half hours in the crown of the nest tree. The male spent much of the night feeding in neighbouring trees of *E. bicostata* and Narrow-leaved Peppermints (*E. radiata*). It did not return to the nest that night, thus giving the impression that the young is cared for entirely by the

female. As our observations led us farther afield in the following hours of darkness we only noted the time of the males return, which was at approximately 3.35 a.m.

As for the Feather-tail Gliders (*Acrobates pygmaeus*) mentioned earlier, I regret to say that when the spot was visited twelve months later, only sixteen lifeless bodies were discovered in their ancestral chamber. This is the only colony of the species I have observed in the area.

Further inspection revealed a colony of some thirty Little Brown Bats (*Eptesicus pumilus*) in the hollow trunk of another tree nearby.

On another occasion I studied the gliding habits of the greater Gliders in a nearby fern gully, where there is an abundance of wildlife. School associates Raymond Carlson, and Geoffrey Sparks, assisted in the construction of a crude but comfortable log cabin which we concealed beneath a cover of Soft Tree-ferns (*Dicksonia antarctica*). It was in late Summer, during our usual excursions on a moonlight night that the Boobook Owl (*Ninox boobook*) as the soloist, was outstanding and mystical; accompanied occasionally by the eerie cry of the Dingo (*Canis familiaris dingo*). The measure of time was beaten out by Great Grey Kangaroos (*Macropus major*) thumping as they passed by. The strolling Wombat (*Vombatus hirsutus*) was seen, and the cheerful Long-nosed Bandicoot (*Perameles nasuta*) scampered along the moonlit track.

But in the trees, the trapeze artists were to me the main attraction. With a loud throaty cough, a Common Grey Brush-tail (*Trichosurus vulpecula*) scaled the trunk of a tall eucalypt with ease, while higher up in the branches *Pseudocheirus laniginosus* swung about suspended by their prehensile tails. Sugar Gliders (*Petaurus*

breviceps) appeared now and again as they drifted through the air from tree to tree.

Then all at once, the bushland orchestra was interrupted by the startling shriek of the Greater Glider. My attention was then concentrated on the great acrobat.

After uttering a series of peculiar gurgles it launched itself from a tall gum tree in a long volplane. It then disappeared among some tall Black Woods (*Acacia melanoxylon*) which obscured its landing. A few minutes later four more Greater Gliders could be heard as they awoke from sleep; and after surveying the surroundings, each animal climbed high in the branches of its tree. Some of the gliders stayed in their home trees where they fed contentedly on the eucalyptus blossoms, while two of them set off towards other feeding grounds. One animal with a long thin tail climbed to the end of a dead bough some ninety feet from the ground, where it sat nodding its head for about fifty seconds, possibly trying to judge the distance for a landing. This is a common occurrence with Greater Gliders.

(Care must be taken not to direct a flashlight on the animals while they are gliding, otherwise its landing speed may not be checked in time, resulting in the animal becoming injured.)

The glider, after checking the distance, gave a powerful heave with its hind legs, and then glided rapidly downwards at an angle of about 55° before landing with a loud flop on a tree some fifty yards away. I then followed it to an area of Red Stringybark (*E. macrorhyncha*) and Long-leaved Box (*E. gonicalyx*), the foliage of which it ate. From here I watched another, a fine specimen, make a long and graceful glide across the narrow gully. This animal had a broad brush tail, and measured about

39 ins. The most graceful glides were observed across this gully, and the numerous skeleton gums provided excellent launching positions. Some Gliders habitually make rapid glides, while others are slow and graceful. Incidentally, the swifter glides are often made by the animals with thin and longer tails. I also noticed that many of the gliders had well charted air routes along which they travelled soon after emerging from sleep. Some gliders preferred a dead bough from which to glide, while others favoured the fork of a bough either just inside, or at the base of the crown. However the longer glides were usually made from the fork of an isolated bough at the very top of the crown. In such cases the animal after launching, would firstly glide clear of the crown and then dive through an opening in the interlocking trees, before gliding horizontally among the trunks. The volplanes observed in the larger stands of *E. bicostata* were usually short, enabling the animal to land half-way up the trunk. Where specific air routes had been formed however, long distance glides were made, and the glider would land on the base of the tree.

Once, while searching for Feather-tail Gliders in a mountain gully, I flashed my spotlight on the glowing eyes of a Greater Glider perched amongst the foliage of a Wonga-vine (*Pandorea pandarana*). On approaching the animal I noticed that it was an albino, only the second I have seen, and like the first albino I observed on Mt. Buffalo, its tail was longer and thinner than usual. For the next three hours I watched the glider closely, and noted its activities. For about an hour it fed on the flower buds of the Wonga-vine; however while in the lower storey it also relished Black Wood (*A. melanoxylon*) blossoms and the tender flower buds of Hazel Pom-

aderris (*Pomaderris aspera*). Later it glided from the top of a large Black Wood, and gradually made its way to the upper storey where it fed chiefly on the blossoms, buds and foliage of Manna Gum (*E. viminalis*), Red Stringybark (*E. macrorhyncha*), Narrow-leaved Peppermint (*E. radiata*) and Broad-leaved Peppermint (*E. dives*). Seldom have I seen a Greater Glider in the lower storey of vegetation except in the Black Woods. It was on one of these occasions that I observed the albino again, the following week-end, with a drab grey and white companion. Grey and white specimens are a common sight, but most of those seen were the usual colour of dusky black on the upper

surface and creamy white underneath. Although many have grey and white tails, some Greater Gliders have a patch of white at the base of the spine. Here the fur is short cropped and usually a soft grey in colour.

Certainly, the Greater Glider is one of the wonders of nightlife in the Australian bush.

[Due to possible overlapping of species in this area, some confusion may have arisen on occasions between the Greater Glider and the Fluffy Glider (*Petaurus australis*). This is indicated by the mention of a shriek, which normally emanates from the latter species, the former being regarded as silent — Ed.].

Letter to the Editor

Dear Sir, **Aboriginal Sacred Rocks on Bald Hill, Clematis.**

As is well known, the proposed Cardinia Creek Reservoir will submerge a considerable amount of country in the Emerald-Clematis area of the Dandenongs, and when full will reach the 550 ft. contour level. Regrettably, when conserving water for the needs of the community the landscape is always altered and much wild life lost. In this particular instance, moreover, it appeared possible that the sacred rocks representing the Crow and two of Bunjil's Young Men, which figure so prominently in the legend of how the Aborigines obtained fire, would also be submerged.

This would have been a tragedy, since Aboriginal antiquities around Melbourne are few, and these rocks are unique; therefore, after consultations with Mr. D. Lee, Hon. Secretary of the Field Nats, and Mr. G. M. Ward, Hon. Editor of the Victorian Naturalist, it was decided that I bring the matter to the attention of the Chairman of the Board of Works, so that, if necessary, steps could be taken for the preservation of the rocks, perhaps by constructing a water-retaining dyke or by removing them to higher ground.

Field Naturalists will be pleased to know that I found that gentleman and the other Officers of the Board most understanding and co-operative. The position of the rocks was surveyed and I have now been notified that the one representing the Crow will be 34 ft. above and 150 yards, and those representing Bunjil's Young Men will be 69 ft. above and 300 yards away from the waters' high level mark. The rocks are therefore safe.

For those interested in the description of the rocks and in their associated legend, they were published by me in the *Victorian Naturalist*, Vol. 78, p. 106, 1961; and a fuller version of the legend, subsequently obtained from an old Aboriginal lady at Coranderrk, was published in my book, *Bunjil's Cave*, in 1968.

Aldo Massola.

Australian Natural History Medallionist for 1968.

Dr Norman Barnett Tindale

by Hans Mincham

(Information Officer, South Australian Museum)

Norman B. Tindale was born in Perth, Western Australia, on 12 October, 1900. In 1906 he went with his parents to Japan where his father was engaged in missionary activity until 1915 when the family returned to Perth. Young Norman's first teachers were Swiss-French at the Tokyo Grammar School. He next attended the Tsukiji Grammar School run by the U.S.A. community, and finally became a student at the Tokyo High School at Yotsuya.

Back in Australia he attended the Perth Boys' School for a year, matriculating there. At this stage his father was transferred to Adelaide and by then Tindale, deeply interested in Natural History, was keen to engage in Museum work. No position was available at the South Australian Museum, but he secured a cadetship at the Public Library under an arrangement that he could transfer to the Museum if a vacancy arose. In 1919, a year later, his opportunity came and he was appointed Assistant to the Entomologist, A. M. Lea.

As a lad in Japan, Tindale developed interests that were eventually to split his scientific pursuits into two very different fields — entomology and anthropology. He was a frequent visitor to the Imperial Museum, Tokyo, where he lingered long studying butterfly specimens as well as all of the material displayed there relating to the primitive Ainu people of northern Japan.

Established at the Museum he pursued entomology until 1921, when he went as a member of a party to Groote Eylandt in the Gulf of Carpentaria, at that time the largest unexplored island off Australia. There he spent 15 months. Lea, the Museum's Entomologist, was keen to have insect specimens (particularly Coleoptera) from islands off Australia, but it was felt that Tindale should also make the most of the opportunity to record observations on, and gather material from, the natives of the region, then largely untouched by European influences. To equip himself for this part of the undertaking Tindale received some training from Sir Baldwin Spencer in Melbourne.

The result of the extended stay on Groote Eylandt (which was made possible by the Church Missionary Society then concerned with the choosing of a site for a Mission Station) was a remarkable collection — insects of many orders as well as mammal and plant specimens, and a large body of observations on, and material from, several tribes which had previously never been definitely noted in literature. This was a very considerable achievement for the young man who spent his 21st birthday on Groote Eylandt.

Back in Adelaide Tindale proceeded with his University studies. Because of his work he could take only one subject a year, which he did until he secured his B.Sc. He continued as

Assistant Entomologist until 1928 when he filled the newly created position of Ethnologist, but he also served as Assistant Entomologist until 1933, when H. Womersley succeeded Lea who had died in the previous year.

In 1929 with H. M. Hale he conducted archaeological excavations at Tartanga and Devon Downs on the River Murray and this work, combined with study of rock shelter sequences in the following years, established a cultural sequence covering 12,000 years. He also identified Pleistocene open-air assemblages dating back to 26,000 years ago.

Granted a Carnegie Travelling Fellowship in 1936, Tindale spent from June of that year to April 1937 visiting museums in U.S.A. and Europe collating Australian data from no fewer than 58 museums. An enormous mass of notes, photographs, and sketches was the outcome. This research forms the background of much of his continuing work on the Australian Aborigines.

Tindale's knowledge of Japanese made him a useful Intelligence Officer during the Second World War and he served in New Guinea, Solomon Islands, and the United States with the rank of Wing Commander. Following the war he spent six months in Japan assessing research data for the U.S. Army and then returned to U.S.A. to spend eight months there preparing a technical report for the U.S. Government and studying in various museums before returning to Australia. In 1959 he made his third trip to U.S.A. to spend that year as visiting Professor of Anthropology at the University of California in Los Angeles. He travelled extensively during vacation periods.

In 1961 Tindale was a special delegate to the Pan Pacific Science

Congress held at Honolulu, following which he carried out a month's research work in U.S.A. and at the British Museum.

Throughout his museum career Tindale was actively associated with the Royal Society of South Australia in which he held the positions of President, Secretary and Librarian. In 1956 he was awarded the Verco Medale. Other activities he found time for in his crowded career included lecturing in Forest Entomology at the Adelaide University and in Conversational Japanese for the W.E.A.

Following his retirement in 1965 from the position of Anthropologist at the S.A. Museum, Tindale engaged in field work in the Western Desert and in various areas in Western Australia in preparation for a new map of the Aboriginal Tribes of Australia. In 1966 he was invited to serve for a year as Visiting Professor of Anthropology at the University of Colorado in Boulder where he was awarded a Doctorate in Science (*Honoris causa*) for research in anthropology. He then lectured for another year at the University of California in Los Angeles while continuing his work on Australian tribes. In 1968 he returned to Australia with a Warren Greenfield research grant to continue field work and studies for his tribal map.

Tindale's scientific career has included an enormous amount of field work. The number of expeditions he has taken part in and which led to significant published contributions to anthropology, archaeology and entomology exceeds 40. His published work includes approximately 120 papers in anthropology and upwards of 40 in entomology. Others range through ornithology, geology and botany. His entomological work in-

cludes extensive writings on the Moth families Hepialidae and Cossidae and the Butterfly family Satyridae upon all of which he is currently working as a relief from his other studies. His complete bibliography totals 175, including three books written in collaboration with H. A. Lindsay. Such a range of active scientific endeavour

was not exceptional in the 19th century, but it is rare to find a scientist in our time who has applied himself so successfully and significantly in such diverse fields. He was a worthy choice, indeed, for the 1968 award of the Australian Natural History Medallion.

Readers' Nature Notes and Queries

These columns are available for all members, young and old, to bring before others their own observations in nature. Correspondence may be sent to the Editor.

Orchids at Sandringham

This heartening note comes from Mrs. Bennett of Sandringham, Victoria.

It was in 1922 that I first set foot on a block of land in Bay Road, Sandringham. The coastal tea tree, *Leptospermum laevigatum* was growing freely and among the vegetation were *Ricinocarpus pinifolius*, *Caladenia pater-sonii*, *Bossiaea cinerea*, Bracken fern (*Pteridium aquilinum*) which latter grew to a height of six feet on the eastern boundary fence.

The property faces north and during 1923 my husband and I built our home there, causing surprise among the builders because we would not allow more than was necessary of the native growth to be cleared for the building.

Gradually over the years as the garden was cultivated, a certain amount of the original vegetation was removed or died out and in 1929 half the property was sold and a neighbours home was built. A few natives survived in our garden (mostly tea tree) and a lawn in front continually mowed.

A patch of *Dichondra repens* (Kidney weed) at the edge of the lawn under a hedge of tea-tree (self sown) has always survived despite the mowing, and this year was somewhat neglected. To my

surprise and delight, among this Kidney weed various grasses and some moss, a colony of greenhoods once common to this district (*Pterostylis curta*) was discovered. Six flowers were in bloom (20 September) and in all sixteen bloomed. Several small stalks about one inch high suggested that the flowers had been mown off earlier. The last flower is now finished (1 November).

The colony of plants, about sixty in all, cover a space at least three feet square in area. Needless to say the colony is now plainly marked so that observations may be made during the coming year.

Diseased Wombats?

From Mrs. J. C. Betheras of East Malvern, Victoria, comes this comment concerning the Nature Note on the wombat by Mrs. Lyndon in the last issue of the *Victorian Naturalist*, 87(1) p. 10.

I have seen a wombat in a similar mangy state to that described, fumbling about in the daytime at Clematis in the Dandenongs. It was quickly put out of its misery by my late husband's gun.

I have wondered since whether this condition was caused through disease, or merely through old age.

A Note on Madimadi †

by L.A. HERCUS*

A recently published work, *The Languages of Victoria: A Late Survey*¹ contains a grammatical sketch of the Madimadi language, as well as some short texts and a vocabulary. Madimadi, called Mutimuti by Tindale², was spoken in the Balranald district of N.S.W. It is one of the 'Western Kulin'³ group of languages, once spoken in Western Victoria and in parts of the Riverina, and it is closely related to the other Western Kulin languages that were recorded, namely Wembawemba

and the Djadjala dialect of Wergaia (from the Lake Hindmarsh area). Our main informant, Mr. Jack Long, is the last full-blood Madimadi man; he now has little practice in using his language and his recollections, though excellent are fragmentary. During a recent visit he recorded some more linguistic material, and as so little is known of Victorian languages in general, it seemed appropriate to publish these further fragments.

*Additional Vocabulary and Morphology*⁴

- binbanai* (my) shin
- buludu* (his) mane. This word was previously attested only in *buludin-buludin* '(your) whiskers'.
- burangada* to snore (cf. WW. *bureŋa* 'to snore').
- burbi* hill. The *r* was weakly articulated and *bubi* was also heard. *burbi*, *bubi* is equivalent to the word for 'head' used without a possessive suffix, exactly like the Dj. word *burb* 'hill', *burbug* '(his) head'.
- daḍi* by and by, after a while.
- dundaḍa* to paralyse.
- ganagaḍa* to take away, to grab (cf. Ma. *gananda*, WW. *ganindja*, Dj. *ganindjela* 'to steal').
- gilbara*, *magwara*, name of the two matrilineal moieties, as in Bagundji.

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†In this paper the same phonemic transcription has been used as in *The Languages of Victoria*. *ŋ* indicates a velar nasal (like 'ng' in 'song'), a dot under a letter indicates a retroflex sound, and a bar under a letter indicates an interdental; (thus *d* may be compared with English 'th').

<i>gilu</i>	by this one; alternative form for <i>gilan</i> , operative case of the pronoun of immediate vicinity.
<i>guleda-wil</i>	wild, fierce, (cf. Ma. <i>gulewada</i> 'to be angry', Dj. <i>gulien</i> 'angry').
<i>mindai</i>	mythical giant snake, well-known from other Victorian languages, but not previously recorded in Madimadi. The operative case of this word is <i>mindaiu</i> , pronounced [ˈmɪndajU]. Evidently after <i>ai</i> , which could easily become [aj], the operative suffix was -u, as after consonants.
<i>minji</i>	hole. This is the non-possessive form of the word. The possessive form was previously recorded in <i>minu daga</i> 'hole-his ground-of', 'his burrow'.
<i>muwengada</i>	to take a wife, to marry.
<i>ninan</i>	this one (object case). This probably is a faulty form based on the false analogy of the personal pronouns <i>jinan</i> 'me' and <i>ninan</i> 'you'. In the Madimadi language material recorded by us all the many different demonstrative pronouns invariably followed the nominal declension and did not distinguish an object case. ⁵
<i>nulun</i>	from that one; ablative of <i>nuli</i> , demonstrative pronoun of middle distance.
<i>nunanun</i>	from that one. This is the ablative of <i>nuni</i> 'that one over there, demonstrative pronoun of middle distance. This word clearly indicates that the post-vocalic form of the ablative can be - <i>nun</i> (as well as - <i>gun</i>). - <i>nun</i> had been heard only once before in <i>mananunai</i> (<i>mana-nun-ai</i>) 'hand-from-mine' 'out of my hand', and it had not been mentioned as a possible alternative to - <i>gun</i> in the list of case suffixes. ⁶
<i>nalinai</i>	back of my neck (cf. Dj. <i>nali</i> 'back of neck').
<i>wuduwanjin</i>	inside you (cf. Ma. <i>wudubar</i> 'in the middle'). The form <i>wuduwanjin</i> 'inside you' shows that in Madimadi the possessive suffix was used to express position in relationship to a person, exactly as in WW. <i>warmandag</i> 'behind me'.

Simple Sentences

<i>nindi</i>	<i>nengadi</i>	<i>nagiladi</i>	sit down and watch
you	sit	watch	
	(imperative forms)		

<i>mada</i> not	<i>nindi</i> you	<i>gumbi</i> sleep (imperative)		don't go to sleep		
<i>dadi</i> soon	<i>gini</i> this	<i>wuduṇi</i> man	<i>bermiladin</i> sneak-will	by and by this man will sneak about		
<i>bugadin</i> took	<i>baibulu</i> kidney-fat-his			he took his kidney-fat		
<i>galgin</i> bone-yours	<i>wuduwarṇin</i> inside-you	<i>buduṇadin</i> destroyed		he destroyed the bones inside you		
<i>bambadin</i> feared	<i>jidi</i> I	<i>buwuga</i> spirit-of		I was frightened of the ghost		
<i>jujugadin</i> dreamt	<i>jidi</i> I	<i>gini</i> this	<i>wuduṇi</i> man	I dreamt about this man		
<i>gumbada</i> sleeps	<i>gini</i> this	<i>wuduṇi</i> man	<i>buranḡada</i> snores	this man is asleep, he's snoring		
<i>bambada</i> fears	<i>nulun</i> that-one-from			he's scared of that man		
<i>jinadu</i> my younger-	<i>beradai</i> not	<i>mada</i> brother-mine	<i>dirawadin</i> wished	<i>laiur, mada</i> woman, not	<i>muwenḡadin</i> married	<i>laiur</i> woman

my younger brother didn't want a wife, he never got married.

A short story in Madimadi

Jack Long related a Madimadi version of the story of *mindai*, the 'maned snake'. This creature is well-known in legends from many parts of Victoria and is variously called 'myndie', 'mindi', 'murndi' in earlier records,⁷ and it is described as having a huge long body and large head. The Madimadi version of the story of *mindai* is interesting for its linguistic content, and for the way it combines the old legend with newer material. Such adaptations are usually

made by people to whom the mythology is still a reality that has to be reconciled with changed circumstances. This version of the *mindai* story also indicates that the Bagundji (Darling River)⁸ type of moiety system with the division into Gilbara and Magwara extended into the Madimadi area. It had previously been known to exist among the neighbouring Dadidadi and Wadiwadi.⁹

mindai dulanḡi. ṇalinanḡu *geṇadin* *buluhu.*
mindai long . back-of-neck-from-his grew mane-his.
The *mindai* was long. It had a mane growing from the back of its neck.

mindai giaga gilbara, giaga magwara.
Mindai one Gilbara, one Magwara.
One *mindai* belonged to the Gilbara moiety, the other was a Magwara.

gilbara guleda-wil, magwara delgu.
Gilbara savage, Magwara good.
The Gilbara one was savage, but the Magwara one was tame.

bugi gini mindai, dagan lanu.
bad this *mindai*, ground-in camp-his.
That Gilbara *mindai* was bad. It lived in the ground - (but it would get in and out through the water-hole and on fine days it would be out or sitting waiting in that spring).

gadinada nengada . bebeda gadini.
water-in sits . jumps-up water
It would sit in the water-hole and the water would then rise up suddenly.

binadin ganagadin wudunji, mujunguru gagadin ninan,
came-out grabbed man, spirit-power-with-his caught him,
It would come out of the water, and grab a man by means of its spirit power.

dundadin ninan.
paralysed him.
and then it paralysed him: (- if you got away in time you were all right. It had this power in its eye).

mindaiu dagadin, nurgadin.
Mindai-by ate, swallowed.
The *mindai* then ate and swallowed him.

wauwunmadin mindai, delgaiadin bilinu, mandu.
full-was *mindai*, good-was stomach-his, flesh-his.
The *mindai* was satisfied then, its stomach and its whole being felt good.

bambadin nunanun wudunji
feared this-one-from man.
People were scared of it; (- and then one day for the first time this *mindai* saw a bullock which had come to the water-hole).

gini didi gubiladin gadini.
this beast drank water.
The bullock had a drink of water.

gagadin gilu mindaiu, mangadin gini didi, dagadin.
caught this-by *mindai*-by, took this beast, ate.
Then it caught the bullock and took him and ate him.

bugi mindai, didi widul. wigadin.
bad *mindai*, beast big. died.
It was bad this *mindai*, and the bullock was too big for it, and so it died.

waiwulanu nagadin, buwadin gini gadinun.
whitefellow-by saw, dragged this-one water-from.
A white-fellow saw the dead *mindai* and dragged it out of the water - (he had to use a whole bullock-team to get it out, and it was then that people could see that the *mindai* was 70 to 80 yards long. That's how the bad *mindai* finished. The Magwara one was all right and it may be there yet).

1. Published by the *Australian Institute of Aboriginal Studies*, Canberra 1969.
2. N.B. Tindale, *Transactions of the Royal Society of South Australia* 64, 1940, p.192.
3. W. Schmidt, *Die Gliederung der Australischen Sprachen*, Vienna, 1919.
4. The following abbreviations have been used:
Ma. Madimadi.
WW. Wembawemba
Dj. Dadjala
5. *The Languages of Victoria: A Late Survey*, p.170.
6. *ibid.* p.161.
7. R. Brough Smyth, *The Aborigines of Victoria*, Vol. 1. Melbourne 1878, p.444; also A.C. Stone, 'The Aborigines of Lake Boga', *Proceedings of the Royal Society of Victoria*, N.S. XXIII (1911). His 'murndi' is only 10 ft. long.
8. A.P. Elkin, 'Kinship in South Australia', *Oceania*, Vol. IX (1938), p.42, and more recently: J. Beckett, 'Marriage, Circumcision and Avoidance among the Maljangaba of North-West New South Wales.' *Mankind*, Vol. 6, No. 10, p.457 note.
9. N.W. Thomas, *Kinship Organisation and Group Marriage in Australia*, Cambridge, 1906, p.49.

Field Naturalists Club of Victoria

ANNUAL MEETING

The Annual Meeting will be held in the National Herbarium on
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BOOK REVIEWS

Birds of Victoria 1 (Urban Areas)

Published by the Gould League of Bird Lovers of Victoria.

5½" x 7", stiff card covers with sewn binding. 72 pp. with 28 pp. of colour illustrations and ecological map of Melbourne area. Paintings by Margo Kroyer-Pedersen. Price \$1.50.



Surprising as it may seem, I have friends who although having lived in Melbourne suburbs all or most of their lives, still tend to confuse starlings with blackbirds, and female blackbirds with English thrushes. I must admit as well, that house-sparrows and tree-sparrows tend to confuse me without some thought on the matter.

From now on however, with the introduction of this, the first part of the Gould League group of bird books; all this confusion and lack of knowledge about our common suburban birds should cease. By skilful arrangement, a tremendous amount

of information about these birds has been placed between the covers of this book.

Beginning with an explanation of "What is a Bird", by Jack Hyett; and continuing with silhouetted bird recognition groups; the ecology of urban areas; the details of individual birds; and finally to a most comprehensive index and bird list — the book has been remarkably well planned. Indeed, is it any wonder when one realizes the amount of work by so many well known people which has gone into its preparation.

Even the birds which do not appear as full color plates; and which are liable to cause difficulty in identification, have been treated as marginal illustrations to show their distinctive characteristics.

If there was a financial reason why previous bird books with hand paintings were unable to be bought, there is certainly no such reason in this case. Indeed, my personal opinion is that I would prefer a collection of this type of book, which one can use; rather than the volume which is transferred from bookshelf to table on rare occasions.

Future titles to be published include:

Birds of the Ranges.

Birds of the Ocean, Bays and Beaches.

Birds of the Inland Waterways.

G.M.W.

Australian Flycatchers and Their Allies

by Brigadier HUGH R. OFFICER with illustrations by PETER SLATER

Published by *Bird Observers Club, Melbourne*, 1969. 108 pp., 12 colour plates, hard cover 10 in. x 7 in. Price \$5.00.

This is a companion volume to *Australian Honeyeaters* by the same author but a higher standard has been achieved. The coloured illustrations of all 66 species make immediate identification a simple matter. In the case of those with similar plumage, a glance at the excellent distribution maps by Alex Stirling or reference to the text should enable identification by even the rankest amateur.

Another important innovation is the placing of males and females on separate pages. This is especially useful where females of closely allied species — such as the red robins — have the same superficially plain colourless appearance. The inclusion of immature plumage is commendable as there are very few easily accessible sources of reference to this important phase.

In the Introduction there is a brief classification of vegetation by Mr. A. R. McEvey of the National

Museum. This should greatly assist the bird watcher with little or no knowledge of botanical terms and perhaps form the basis of a standardised habitat reference. Apart from the enormous wealth of information supplied, the Brig's inimical style is a source of delight. Who, for instance, will in future fail to recognise the Leaden Flycatcher when he hears its call of "squank"?

As far as possible the coloured plates are contiguous to the text though I found it mildly irritating when this was not so, no doubt because of printing limitations. Also the omission of the small spot on the forehead of the Flame Robin should be rectified in future editions. These are minor points which do not detract from the excellence of this book which will be of great value to all bird watchers and to anyone even vaguely interested in birds.

Pauline Reilly

Orchids of Australia

A complete edition drawn in natural colour by W. H. Nicholls. Edited by D. L. Jones and T. B. Muir. Melb., Thomas Nelson (Aust.) Ltd., 1969. Price \$30.00. Boxed. Size 13" x 10".

During September 1969 the Sixth World Orchid Conference was held in Sydney. To coincide with this event Thomas Nelson (Aust.) Ltd. published in one volume the monumental work by Nicholls on Australian orchids, making available for the first time a definitive collection of the authors work.

A member of our club, David Jones B.Sc.Ag. Horticultural Research Officer with the Victorian Depart-

ment of Agriculture, collaborated with Bruce Muir B.Sc., Taxonomic Botanist at the National Herbarium to edit this work.

There are 750 species of orchids in Australia, most of which are endemic. These belong to 90 genera of which about 20 are endemic. Their unusual flowers are often seen mingled with the herbs of the forest floor or in contrast to the grasses on the hillsides.

Will Nicholls' formal education was only at Primary level. He became a bookbinder, and then a gardener. With a great interest in Australian orchids he felt the need for a comprehensive authoritative work describing these particular plants. Nicholls realised that a verbal description was not adequate for the identification of species, so he taught himself painting and enough Latin in order to compose formal descriptions for the many undescribed orchids which he found. It took Nicholls 27 years to prepare the monograph, which consisted of 500 orchid portraits, with numerous dissections of remarkably accurate detail.

It was intended to produce a total of 600 plates in groups of 24, publishing the estimated 25 parts over a period of 10 years. As publication proceeded the author would continue to draw missing subjects and newly described species. The retail price was to be £7.10.0 (\$15) per part. Only four parts appeared as sales dwindled and further publication was thought to be uneconomic. The price for the original work would have been approx. \$400 in 1950, certainly far more money than an amateur botanist could afford.

This one volume edition naturally has had to be modified to put it into a more realistic price range. The plates, illustrating almost 400 species, have been separated from the text and have been bound together at the back of the book, which makes reference a little more difficult. The captions are printed below the plates which is an improvement on the original method of placing them on the opposite page. The paintings in the first part of the original edition were reproduced photographically, whilst in parts 2-4 they were copied by hand on to zinc plates, and then printed by a lithographic process. In

the present edition all the plates are reproduced photographically. This method is less expensive, and due to changes in techniques the reproduction in the majority of the plates is superior, with the exception of two or three, which through necessity have had to be photographed twice, making the final print a little fuzzy. Some of the larger plates are double page spreads, and in a few places the centre fold is across sectional details. The colours compare reasonably with the original paintings, which are as near to nature as watercolour pigments will allow, thus affording accurate identification by comparing a specimen with the plate. There are 476 colour plates, the balance of these from the original work were so incomplete as to make it unworthwhile including them in this volume.

The text is printed in two columns, making it more compact. It includes units of measurements, abbreviations, and a glossary of terms. There is a key to genera which is most useful, however the keys to species which were printed in the original publication have been omitted. To bring them up to date would have meant a major revision in every genus.

Although this volume may seem expensive, the value is in the wealth of information, precise descriptions and the magnificent colour plates. For the identification of the majority of Australia's orchids, the complete edition, *Orchids of Australia*, is the only work that you need to consult. No doubt the book will have the added value of being an important collector's piece of Australiana.

A limited De luxe Edition of 150 numbered copies is also available at a cost of \$70.00. This edition is fully bound in leather and blocked with an orchid illustration on the face.

Rex and Sue Filson.

Unusually Large Specimens of Topaz and Augite

By A. W. BEASLEY*

Unusual specimens are often brought to the National Museum of Victoria for identification, and some are presented to the Museum. This article is concerned with two unusually large specimens of topaz and a large specimen composed mainly of augite in the Museum collection.

The largest topaz known to have been found in Australia is in the Museum collection. It weighs 6 lb. 6½ oz. and is pale bluish green in colour. This specimen, portion of a very large crystal, was discovered in an old stream gravel at a depth of 60 feet during alluvial gold mining in the Cooyal Creek area near Mudgee, New South Wales. It was donated to the Museum about 100 years ago, and is believed to have been exhibited at the Intercolonial Exhibition of Australasia held in Melbourne during 1866 and 1867. In 1874 Professor Liversidge of Sydney University referred to the existence of this outstanding topaz specimen in the Museum, in a publication entitled "The Minerals of New South Wales". Although waterworn, the topaz still exhibits some crystal faces. Most probably it did not travel far after it was liberated by weathering from granitic rocks in the area. Much of the specimen is clear and flawless, but there is a well-defined crack which has resulted from the perfect basal cleavage.

Topaz, a fluosilicate of aluminium, occurs in coarse-grained granites and pegmatites, and is formed by the action of gases containing fluorine and water vapour emanating from igneous intrusions within the earth's crust. It crystallizes in the orthorhombic

system, and prismatic crystals occur in cavities in the coarse granitic rocks. Usually one end of the crystal is terminated by pyramid faces and the other is flat as, when removed from the rock, breakage has occurred along a basal cleavage plane.

Most Australian topaz is pale blue or colourless, the yellow variety being rare. As it is durable and heavy, topaz is found in sands and gravels derived from the weathering of granitic rocks. It occurs associated with alluvial cassiterite (tinstone) particularly in New South Wales, Queensland, Victoria and Tasmania, where many waterworn pieces of pebble size have been found.

The second largest topaz specimen in the Museum collection is a waterworn crystal from near Stanthorpe in Queensland. It weighs 2 lb. 1 oz. and



Plate 1: Waterworn topaz crystal from Stanthorpe, Queensland. Weight = 2 lb. 1 oz.

* National Museum of Victoria.

Photo: E. R. Rotherham

is pale blue in colour. This outstanding specimen was found in an alluvial deposit during tin mining and was donated to the Museum about 60 years ago. Although waterworn, much of the original crystal shape is discernible.

Topaz is a valuable gemstone, and many beautiful gems could be cut from these two unusually large specimens. However, because of their special value as rare specimens, they will never be cut. Other smaller topazes, particularly ones from Oban in New South Wales, have been cut and faceted into quite large gems of fine quality.

In April, 1969 an interesting specimen found on the flanks of Mount Franklin near Daylesford, Victoria was submitted to the National Museum for identification. It was a nodular body with a maximum diameter of $4\frac{1}{2}$ inches, and proved to be

composed mainly of augite. This unusual specimen, discovered by Mr. F. G. Powell of Mount Franklin, was subsequently donated to the Museum.

Mount Franklin is a well preserved volcanic cone formed by explosive activity probably about 20,000 years ago (in late Pleistocene times). Dunn (1912) has recorded the occurrence of occasional nodules of olivine, angular fragments of feldspar and small pieces of augite on the crater rim and slopes of this scoria cone. Coulson (1954) has referred to masses of olivine, masses of augite and large phenocrysts of anorthoclase feldspar in the plug of basalt found in the crater of Mount Franklin.

Most of the augite found loose on the surface and by digging in the scoria (rough, angular pieces of very vesicular basalt) at Mount Franklin is of small size, and the specimen here described is an unusual one. Presum-



Plate 2: Nodule composed mainly of augite from Mount Franklin, near Daylesford, Victoria.

Plate 3: Topaz from Cooyal Crk., near Mudgee, N.S.W. Wt. = 6lb. 6½ oz.

Photo:
E. R. Rotherham



ably it represents a xenolith, ejected with the scoria, which crystallized at a fairly great depth in the earth's crust. This nodular mass shows three plane joint faces in process of rounding; elsewhere it has been fairly well-rounded, presumably from abrasive action within the vent and from partial melting. Under the microscope thin fragments of the augite appear pale greenish to purplish brown in colour, and they are slightly pleochroic.

Xenolithic inclusions are not uncommonly found in Tertiary and Quaternary basalt and basaltic scoria in Eastern and Southern Australia (Green, 1964). Most are composed mainly of olivine, and xenoliths composed mainly of augite are much rarer. Some of the inclusions are lava-en-crustured (volcanic bombs) while others

are not. Volcanic bombs are not as common at Mount Franklin as at Mount Leura (Camperdown) and certain other volcanic hills in Victoria. They are usually less than 9 inches in maximum dimension at Mount Franklin and most of them have a nucleus or core consisting chiefly of olivine grains.

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Field Naturalists Club of Victoria

General Meeting

12 January

About eighty members were present and the President, Mr. E. R. Allan, was in the chair.

He announced that the Secretary, Mr. David Lee was in hospital. The wishes of the members for his recovery were sent to him.

Members were pleased to hear that both Mr. G. Hooke and Mr. E. Hanks were recovering from their illnesses.

The receipt of Christmas Card greetings was reported. These included those from Sir Rohan and Lady Delacombe, Mammal Survey Group, S.G.A.P. and Ringwood F.N.C. Photoflora notices were received for distribution, the dates of screenings being 2, 3, 4 March in Melbourne, Victorian Youth Club Association Rooms; 1 April at Ringwood; and 4 April at Montmorency. A letter from Mr. Piesse of the Australian Conservation Foundation asked for information of all groups concerned with conservation. This will be published early in 1970 and may be purchased. A reference was made to a sacred aborigine rock at Bald Hill near Clematis, which, it was feared, may have been covered with water from the new dam on Cardinia Creek, but Mr. Massola has been in touch with the M.&M.B.W. and assures the club that it will be clear of the water and on the shores of the lake.

The President announced that nominations for office bearers were to be received at this meeting.

A letter from the Board of Works asks the club to notify them of items of interest, particularly botanical species, in the Yarra Valley.

Mr. D. McInnes asked any members who received 2 copies of December *Naturalist* or 2 copies of January *Naturalist*, instead of one of each, to return one to the treasurer, upon which they will receive the missing one.

The subject for the evening was "Members Night" organized by Mr. J. Strong. Mr. E. Swarbreck showed pictures of the old gold settlement of

Whroo now abandoned, and the Namma Water Holes of the aborigines. One picture showed a blazing grass tree set alight by youths who were spoken to by a Field Naturalist Member who was told by a woman to mind his own business. This was reported to the ranger. Some time later it was learned that the ranger had done nothing because the woman was a policeman's wife.

Another picture of Whroo showed eucalypts which appeared to be burnt but were defoliated by cup moth caterpillars—"Chinese junks" which swarmed in countless thousands. Another slide showed a nearby sign "Traction engine drivers are requested to whistle here" a reminder of the old days when horseman could be warned of the approach of the engine so that they could control their frightened horses.

Another slide showed the red prostanthera shown to Mr. Swarbreck by Mr. Ken King. Miss Madge Lester showed fine colour slides of a large golden orb spider in its web on the top of which was a litter of apparent remains of prey. Successive shots showed the small male approaching from above through the litter, very cautiously rushing back when the web was shaken, but returning to put its cusps into an opening in the large body of the female which was hanging as in a trance upside down. After a few seconds the male came down dithering backwards and forwards.

Miss Lester quoted other observers who report that the tiny male makes a small bit of web into which sperm is shed which is then drawn up to the mouth for transferring to the female later.

Miss Jean Woollard showed slides of the Native beech male and female flowers. These may occur on the same tree.

Another slide showed the red bottle brush, *Callistemon citrinus*, which is disappearing in Gippsland due to the systematic burning. Other pictures were of a Goodenia near Lakes Entrance and Caltha flowers at Mt. Buffalo, and fine coast shots of Port Campbell National Park. Miss M. Moon, brought beautiful slides of King's Canyon, includ-

ing masses of *Blennodia canescens* and a Groundsel after rain near Wallaroo Ranch, with an engaging young kangaroo rescued after its mother was shot.

Mulga, thryptomene, cycads, ghost gums and river gums were found in the red canyon with its angle turn, steep sides and domes.

Mrs. E. Bennett showed slides of *Pterostylis curta* which had come up this year in her garden behind a native tea tree hedge amongst moss and kidney weed; the first appearance in over 20 years and now showing 60 plants. She also showed a mass of snow daisies from Mount Hotham, and an interesting series of Curly Kale showing beautiful colours and quaint forms in a suburban garden.

Mr. Alan Morrison showed a series of the green tree ants and nests from the Northern Territory. He explained that these ants with bottle green abdomens are a little smaller than a meal ant and can give a nasty nip. They make their nests from 3 feet to 20 feet up a tree, and the nests are 4-5 inches in diameter. They pull leaves together and workers grip their larvae and move them back and forward between the edges of the leaf while the larvae spin out silk which sticks the edges together. Those larvae then must pupate without a covering cocoon. One picture showed 7 ants taking a piece of aluminium foil from cheese 15 feet up a trunk of a tree. The president thanked the members who gave the talks and Mr. A. Morrison for projecting the slides.

Mr. J. Baines voiced the appreciation of members for Miss Allender's organization of excursions, and noted the honour of M.B.E. conferred on Mr. McKenzie for services to tourism, and whose firm provides the transport for the Club excursions. Miss Allender sent a telegram of congratulations to Mr. McKenzie.

Mr. W. Woollard renewed an appeal for a better public address system in the hall. By a show of hands he gained the members approval for a request to council to act in the matter. Mr. Swarbreck advised an approach to C.S.I.R.O. officials at Hightett for advice on the type of address system suitable for the hall.

Mr. J. Baines stressed the threat to the Barrier Reef by the proposed oil

drilling of Ampol and a Japanese group not far from Mackay. He pointed out that Californian experts, aware of the Santa Barbara oil spillage, had written to Judith Wright who made a trip here to alert people to try to stop the drilling of the reef which doesn't belong to Queensland, but to the whole of Australia, and the world.

He moved that the Club write to the Premier of Queensland and the Manager of Ampol to prevent the drilling so that the reef will be kept. Mr. Curtis seconded the motion which was carried. Miss Moon suggested writing to the Prime Minister also and Mr. Allan said that the Australian Conservation League and the Prime Minister appear to be against the drilling but there was uncertainty about the rights of the Commonwealth and State Governments.

Nature Notes and Exhibits

Mr. A. J. Swaby brought *Crinum flaccidum* (Murray Darling lily), *Lobelia alata* (angled lobelia) and *Melaleuca longicoma* (W.A.), and rhizomes of *Gahnia radula*.

Mrs. M. North showed Petrified wood, quartz, and jasper from Ela beach Port Moresby; and petrified Kauri gum from North Island, New Zealand.

Mr. Graham Love showed chrysocolla (Kalgoorlie dolomite) from Darwin; martite (pseudomorphing magnetite—Broken Hill); silver, lead, zinc (Onslow); garnet crystals (Broken Hill); glacial tillite (Bacchus Marsh); Au-hematite (Tennant Creek); and Arsenic (Tenterfield) which is so dangerous to mine that miners may only work 2-3 hours each day.

Mr. D. McInnes brought rock from Pretty Valley area quarry showing the gneissic rock with a band of granodiorite 2 feet into it. He also described projecting tubes 3 or 4 inches high that Mr. A. Godward found at Mt. Beauty. These led into tunnels underneath from which large ant workers and soldiers came out.

Mrs. Woollard said that the berries on *Dianella tasmanica* were very good this year.

Some interesting fossils of marine life from Henbury Station Finke River, 90 miles south of Alice Springs were on display.

Hawthorn Junior F.N.C.

ANNUAL REPORT 1969

Key Office Bearers 1969/70.

President: Mr. D. McInnes.

Secretary: Tim Anderson, 1 Doona Ave., Kew.

Treasurer: Jenny Forse.

Editor and Club Recorder: Barry Cooper.

Excursion Secretary: Pam Conder.

Publications Officer: Michael Howes.

Membership showed a slight rise during the year, now being about 150.

Meeting attendances also averaged slightly higher.

Meetings 1969:—

- 31 January — Members' Holiday exhibits night.
- 28 February — "Seals of Western Port", by R. Warneke.
- 28 March — "Tidal Zones along our Sea Shores", by G. Van Rompaey.
- 2 May — "Butterflies", by C. McCubbin.
- 30 May — "Insects and Quarantine", by J. Barnes.
- 27 June — "Caves and Caving", by E. Hamilton-Smith
- 25 July — "The Banksia Family", by F. Rogers.
- 29 August — Celebration of our 26th Birthday.
- 26 September — "Birds of the Seashore", by H. Jarman.
- 31 October — "Whales", by J. Hyett.
- 5 December — "Beetles", by P. Kelly.

The August meeting was also highlighted by colour slides of Club activities in the past few years.

Excursions:—

A record number of field trips were available to members in 1969. These comprised short day or half-day trips, involving car travel; and long nature rambles of up to ten miles.

The first included a number of Geology Group outings which members attended.

1 February—Albert Park Lake (Pond Life)

29 March—Beaumaris (Fossils and Marine Survey).

8 June—Korkuperrimal Creek (Geology Group).

10 August—Coimadai (Geology Group).

7 September—Coldstream (General).

27 September—Laverton (Birds and Pond Life).

9 November—Anakie-Maude (Geology Group).

30 November—Brisbane Ranges (Beetles).

Long walking trips were an innovation in 1969. The trips were originally aimed at providing a different type of outing for older Haw-

thorn Juniors and more energetic F.N.C.V. members. However, many younger Hawthorn Juniors have taken part in the excursions. The Club is grateful to Mr. T Sault, whose enthusiasm has contributed largely to the success of these trips held so far.

Outings organized were:—

2 March—Moorooduc-Mt. Eliza area.

4 May—Diamond Creek-Hurst-bridge.

14 December—Cape Schank-Rye Back Beach.

The Club is now planning a five day camp for next Easter, visiting Wyperfeld National Park and the Little Desert.

Publications:

The Club Magazine, "The Junior Naturalist", has completed Vol. 5. It was again re-organized at the beginning of the year, due to Postal registration. Because of stocks on hand, no new booklets were produced during the year. However, at least three new publications are planned.

In May, Council appointed Michael Howes as the Club's first Publications Officer. Following success at the Nature Show, Michael now also sells nature books, through arrangement with the F.N.C.V.

Nature Show:—

The club organized the following exhibits in the 1969 show:—

Embedding specimens in Plastic—X-ray Animals—Ants (all by Jenny Forse). Skulls—Reptiles (both by John Bevan and Stephen Wilson). Gem Cutting (Gary Wallis). Plant Sectioning (Carl Meyer). Tektites (Barry Cooper).

The Show was most successful for the Club, as there was almost a complete sell-out of publication stocks on hand.

Subscription Concession:—

The Club has introduced a Magazine subscription of 30 cents per annum. Membership fees remain at 80 cents for Juniors and \$1.20 for Adults per annum.

Office Bearer Changes:—

The Club lost the services of Susan Beattie and Ian Knox as Secretary and Excursion Secretary during the year. The task of Secretary was divided, Rosalind St. Clair undertaking to mail "The Junior Naturalist". Alan Burns was appointed Assistant Editor.

In July, the Club honoured its President, Mr. D. McInnes, with life membership for outstanding service.

F.N.C.V. PUBLICATIONS AVAILABLE FOR PURCHASE

FERNS OF VICTORIA AND TASMANIA, by N. A. Wakefield.

The 116 species known and described, and illustrated by line drawings, and 30 photographs. Price 75c.

VICTORIAN TOADSTOOLS AND MUSHROOMS, by J. H. Willis.

This describes 120 toadstool species and many other fungi. There are four coloured plates and 31 other illustrations. New edition. Price 90c.

THE VEGETATION OF WYPERFELD NATIONAL PARK, by J. R. Garnet.

Coloured frontispiece, 23 half-tone, 100 line drawings of plants and a map. Price \$1.50.

Address orders and inquiries to Sales Officer, F.N.C.V., National Herbarium, South Yarra, Victoria.

Payments should include postage (9c on single copy).

F.N.C.V. DIARY OF COMING EVENTS

GENERAL MEETINGS

Monday, 9 February—At national Herbarium, The Domain, South Yarra, commencing at 8 p.m.

1. Minutes, Reports, Announcements.
2. Correspondence.
3. Subject for the evening—"Through the Kimberleys" by Mr. Alan Morrison.
4. New Members
Those elected during Dec. and Jan., together with those elected in Feb. will be listed in the March **Vict. Nat.**
5. General Business.
6. Nature Notes and Exhibits.

Wednesday, 11 March—Annual Meeting.

GROUP MEETINGS

(8 p.m. at National Herbarium unless otherwise stated).

Thursday, 12 February—Botany Group. Identification of Western Australian wildflowers on slides. Would members with good, correctly named slides, bring a selection to be shown first so that those with unidentified slides of the same species can name them. If time allows, these will be followed by un-named slides, and an attempt made to identify them. Books or hand viewers may also prove helpful.

Wednesday, 18 February—Microscopical Group.

Friday, 27 February—Hawthorn Junior F.N.C. at 8 p.m. in Hawthorn Town Hall.

Monday, 2 March—Entomology and Marine Biology at 8 p.m. in National Museum, Russell Street, Melb.

Wednesday, 4 March—Geology Group.

Thursday, 5 March—Mammal Survey Group at Sir Arthur Rylah Institute for Environmental Research, corner of Brown St. and Stradbroke Ave., Heidelberg.

Friday, 6 March—Montmorency District Junior F.N.C. at Scout Hall, Petrie Park, Montmorency.

F.N.C.V. EXCURSIONS

Sunday, 15 February—Sorrento area. Subject—Marine Biology. Leader Dr. Brian Smith. Coach leaves from Batman Ave. at 9.30 a.m. Fare \$1.50. Bring 2 meals.

Good Friday, 27 March to Monday, 30 March—Warrnambool. A coach has been chartered for the period, and accommodation booked. Coach fare \$15.00 should be paid when booking. Motel, D.B.B. \$6.50 per day (individual payment). Cheques for coach to be made out to Excursion Trust.



Magnificent stand of White Mountain Ash, *Eucalyptus regnans*, in the Marysville State Forest

FORESTS COMMISSION VICTORIA

. *preserving the beauty of our
forests for your enjoyment.*

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.

Patron:

His Excellency Major-General Sir ROHAN DELACOMBE, K.B.E., C.B., D.S.O.

Key Office-Bearers, 1969/70

President:

Mr. E. R. ALLAN

Vice-President: Mr. T. SAULT

Hon. Secretary: Mr. D. LEE, 15 Springvale Road, Springvale (546 7724).

Hon. Treasurer: Mr. D. E. McINNES, 129 Waverley Road, East Malvern 3145 (211 2427).

Hon. Editor: Mr. G. M. WARD, 54 St. James Road, Heidelberg 3084.

Hon. Librarian: Mr. P. KELLY, c/o National Herbarium. The Domain, South Yarra 3141.

Hon. Excursion Secretary: Miss M. ALLENDER, 19 Hawthorn Avenue, Caulfield 3161.

Subscription Secretary: Mrs. N. E. LEWIS, 1 Billing Street, Springvale 3171 (546 4649).

Sales Officer: Mr. B. FUHRER, 25 Sunhill Avenue, North Ringwood, 3134.

Group Secretaries:

Botany: Miss M. BUTCHART, 23 Loch Street, Hawthorn East 3123 (82 1616).

Geology: Mr. T. SAULT, 9 The Avenue, West Rosebud.

Microscopical: Mr. M. H. MEYER, 36 Milroy Street, East Brighton (96 3268).

Mammal Survey: Mr. P. Homan, 40 Howard Street, Reservoir 3073.

Entomology and Marine Biology: Mr. J. W. H. STRONG, Flat 11, "Palm Court", 1160 Dandenong Rd., Murrumbeena 3163 (56 2271).

MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available, and other activities are indicated in reports set out in the several preceding pages of this magazine.

Rates of Subscriptions for 1969

Ordinary Members	.....	\$7.00
Country Members	.....	\$5.00
Joint Members	.....	\$2.00
Junior Members	.....	\$2.00
Junior Members receiving <i>Vict. Nat.</i>	.....	\$4.00
Subscribers to <i>Vict. Nat.</i>	.....	\$5.00
Affiliated Societies	.....	\$7.00
Life Membership (reducing after 20 years)	.....	\$140.00

The cost of individual copies of the *Vict. Nat.* will be 45 cents.

All subscriptions should be made payable to the Field Naturalists Club of Victoria, and posted to the Subscription Secretary.



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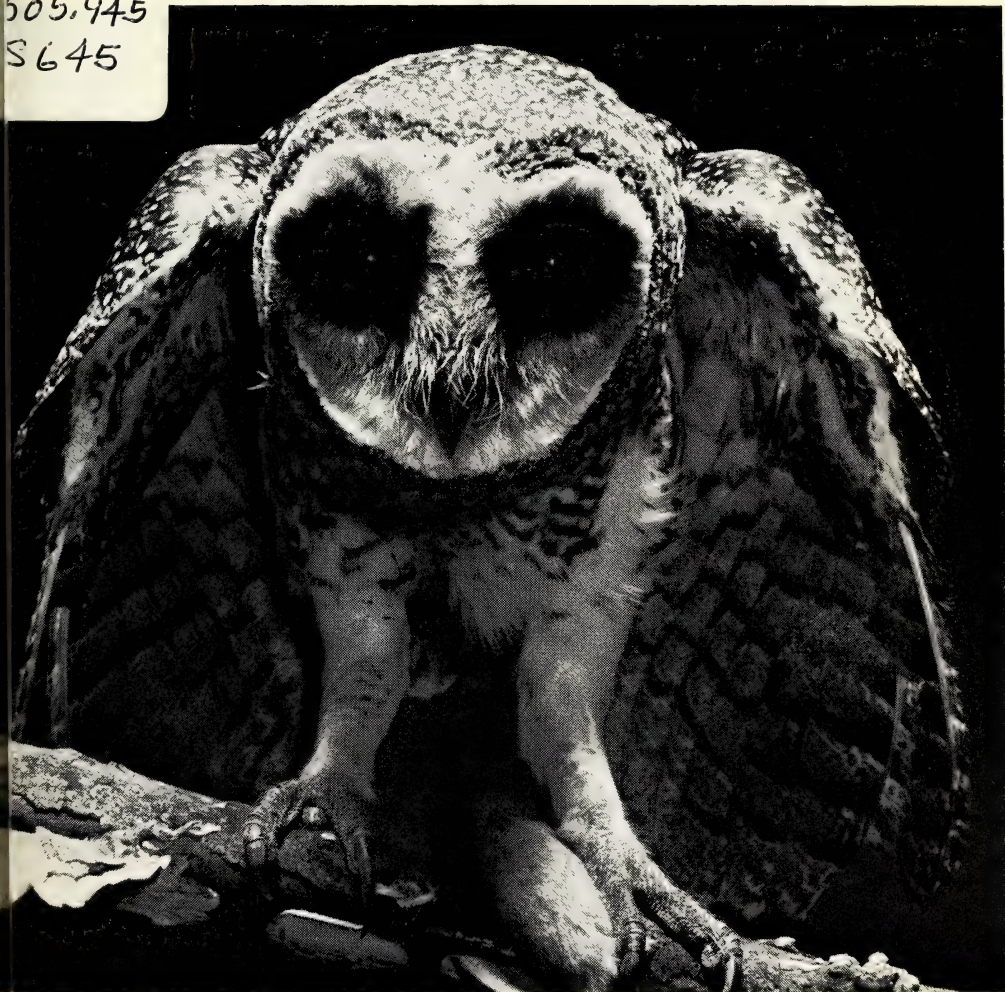


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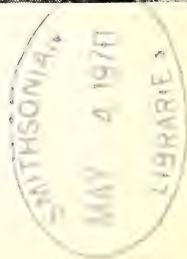
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Magnificent stand of White Mountain Ash, *Eucalyptus regnans*, in the Marysville State Forest

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The Victorian Naturalist

Editor: G. M. Ward

Assistant Editor: P. Gahan



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Sooty Owl (*Tyto tenebriosa*). Photographed near the Atherton tablelands, Northeast Queensland.
(Bird captured as nestling; kept in captivity). Photo: Graham Pizzey.

March, 1970

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Natural History Features of North-West Australia

October 1969

BY ELIZABETH K. TURNER

NORTHWARDS FROM THE GOLFIELDS INTO THE MULGA

Drought conditions prevailed over this fascinating land, as I entered it on 1 October, via Kalgoorlie, Menzies, Leonora, Agnew then N.W. to Mt. Magnet, in a comfortable bus, in the company of 27 other "conservationists" from N.S.W. and Victoria.

We travelled north over flat red loam covered with an icing of bluish iron-stone gravel.

At first there were numerous Salmon gums (*Eucalyptus salmonophloia*) and white-stemmed Mallees, varieties of saltbush (*Kochia* and *Atriplex* sp.) and stands of Mulga (*Acacia aneura*) with silver-grey narrow leaves all held erect to deflect the sunlight, whereas the Wilga (*Geijera*) which attains a somewhat similar height and appearance, had leaves which pointed downwards.

None of the ten different varieties of Mulga were in flower, but later at Wilga Mia in the Weld ranges we were able to find a few rare trees with seed. There was also a fascinating species of *Minnieritchie* with dark-red bark which peeled in short curls.

A couple of miles south of Leonora we passed the old Sons of Gwalia mine and discovered that Herbert Hoover later to become President of the U.S.A. was one of the first mine

managers there in 1897-8. His house still stands and the sideboard from this house complete with carved wooden eagle is proudly displayed in one of the public rooms of the Meekathara Hotel. Hoover's mining engineer, Agnew, is commemorated a few miles further north by a town site consisting principally of a dilapidated public house that refused to sell drinks to a thirsty bus load twenty minutes before official trading hours.

The country surrounding these mining areas was earlier severely denuded of vegetation to feed the gold batteries yet we saw numerous wattles in flower and there were stands of the Bell-fruit tree (*Codonocarpus cotinifolius*) and *Casurina cristata*. *Duboisia hopwoodii* was found in flower and some spectacular bushes of yellow *Cassia pleurocarpa* and gold and red *Petalostyles millefolium* as well as mauve flowers of *Hemigenia dielsii*, and several species of *Eremophila*.

At an abandoned gold mine we stopped to collect rose and orange quartz, green chrysoprase and pieces of opalite and chalcedony and moss agate; while nearby was a very large tree, *eremophila* (*E. platycalyx*) from which most of the white corollas had fallen leaving rose-red calyces; indeed *eremophila* in lilac, white, red and often spotted varieties were probably the most spectacular plants for the next 500 miles.

Our first overnight camp was on the red sand about 10 miles north of Menzies, and near a large Rottnest Pine (*Callitris preissii*).

Here we were awakened by that most melodious of all Australian songsters, the Pied Butcher bird, (*Cracticus nigrogularis*) who seems to test each rich flute-like note for intensity and echo-quality.

At Mt. Magnet the garage attendant told us they had received only 3 inches of rain in the last eleven months but this did not deter the Mullamullas in pink (*Ptilotus rotundifolius*) and in mauve (*P. exaltus*) from growing along the dusty road side.

Between Mt. Magnet and Cue there is a wide salt lake named Lake Austin, which was dry and covered with salt crystals which had blown on to the surrounding dry country. This area was devoid of vegetation except for the eremophilas, cassias and ptilotis.

Near dry water courses we welcomed the shade of River Red gums (*E. camaldulensis*) and amongst the mulga we sometimes found Wild Orange (*Capparis lasiantha*) in flower.

Red-fruited Quandong (*Santalum acuminatum*) was observed and we began here to see our first Snappy Gums (*E. brevifolia*) of which we saw more as we drove north.

Occasional bushes of the Yellow Pennant (*Loudonia roeii*) lined the road and there was a showy Grevillea (*G. juncifolia*) with golden flower spikes.

In this so-called Eremean Province, we saw many Red Kangaroos, mostly in the early mornings soon after breaking camp, whilst male emus with large chicks whose plumage had become adult in colour, crossed the road at

any time during the day. A large monitor, the Perenti of the Centre, but here known as a Bungarra, gave us a slow-motion demonstration of waggly walking — using the opposite hind and forefeet together at each step. Port Lincoln parrots (*Barnardius zonarius*) seemed to be the only other common bird in this arid region.

At Wilgia Mia, north west of Cue, we visited an ochre mine used for centuries by aborigines and now very close to a newly staked copper and nickel mine. Here we filled our bags with bright green malachite, and the rarer deep-blue azurite (Copper carbonate) all free of charge, whilst at Cue and Meekathara the “rock-hounds” of the party bought samples of local stones including quartzite crystals — smokey coloured, and amethyst, and variously coloured chalcedonies, cherts, jaspers, tourmaline, and delightful powder-green variscite (Hydrous aluminium iron phosphate).

They were also fascinated with the rainbow-coloured Chalcedony, recently discovered at Mooka Station and called Mookaite. Luckily we had a lapidary teacher in the party, and she was kept busy answering queries from the delighted novices. It seems impossible not to become enthusiastic about rocks and minerals as well as botany in this area of W.A. There was enough water for swimming in the middle branch of the Gascoyne River and near here we stopped to admire an avenue of lilac flowered hibiscus (*H. farragei*).

WE CROSS THE 26th PARALLEL INTO THE NORTH-WEST.

40 miles north of Meekathara we crossed the 26th parallel and so officially entered the north-west, according to a wayside notice.

The highest point on the Great Northern Highway (200 feet above sea level) is crossed at the Collier Range, the divide between the Gascoyne and Ashburton watersheds, 160 miles north of Meekathara. This was the first range that one could say somewhat resembled a range, with a few bluffs and breakaways and on the top, a water tank supplied by storm water from wide V shaped corrugated-iron roofs.

Here was a patch of spinifex, and we discovered Corkwood (*Hakea lorea*) in flower, some Ghost gums (*E. gamophylla*) and both lilac and deep-violet forms of *Keraudrina*, as well as a grey-green and lilac labiate (*Teucrium* sp.) with an aromatic odour.

Near here we also found *Grevillea excelsior* in flower.

ACROSS THE TROPIC OF CAPRICORN INTO THE HAMERSLEY IRON PROVINCE

Our next delightful camp was in the Ophthalmia Range, west of Mundiwindi and almost on the Tropic of Capricorn.

Here amongst the Angophoras, Bloodwoods, Snappy Gums, and Whitewoods (*Atalaya hemiglauca*) we slept without tents, beneath a starry sky and a three-quarter moon. The absence of mosquitoes or other insects (except scorpions) was remarkable in the north west.

We were camped on iron-ore deposited in layers in Proteozoic times on top of the Archaen jasperlite of the Hamersley Ranges. This enormous iron province occupies 25,000 square miles of territory forming the watershed between the Fortescue River in the north, and the Ashburton river in the South.

These iron deposits are the largest in the world and lie in an area so desolate and arid, as to be unsuitable for agriculture; the rainfall varies from 3 to 30 inches, but often the total annual fall occurs on one day in summer.

The winter temperature is said to vary from 75° to 85° but in summer it is always above 90°. We found it hot, and 105° nearer the coast.

One of the party had an electric torch with a magnetized patch along the side and when she picked this up from the ground, iron particles were adhering in rust-coloured strands, like coconut fibre, to the patch.

Next morning we drove into the smart new township of Mt. Newman where ore of more than 64% iron is being scooped and blasted from Mt. Whaleback.

The majority of hill summits are gently domed as the name Whaleback suggests, and they represent residuals of an older land surface. This ancient profile has economic significance as most of the large haematite-goethite deposits are found below this surface.

Due to hydration and oxidation over eons of time most of the iron-ore is not magnetic now.

We were guided up Mt. Whaleback (2,000 feet high, 5 miles long and three-quarters of a mile wide) on a road with a 7% gradient to allow 120 ton Haul-Paks to carry rock down to the crushing plants.

The view over the Ophthalmia ranges from the spinifex covered top of the mountain was extensive and one could see the trucks loading below, on a specially built heavy railway line on which the train travels to Port Hedland 200 odd miles north at a speed

of 35 miles per hour, "no more, no less" said our guide.

In some areas along the mined cliff face, we were able to obtain samples of dark-red jasperlite, banded with whitish dolomite, a kind of limestone.

THE FORTESCUE RIVER AREA AND SPINIFEX COUNTRY.

On one of the dry branches of the Fortescue River, we found the lilac Native Rose (*Gossypium robinsonii*) and Wild Currant (*Canthium latifolium*). Also there were Cadjeputs, and Native Willows (*Pittosporum phillyraeoides*) and the hairy lion-coloured *Dicrastylis exsuccosa* of the Verbenaceae family. Here we also saw a small rock wallaby with a black tip to his upcurled tail.

North of the Hamersleys the plain was covered with small shrubs and spinifex (*Triodia pungens*) in flower and always along the horizon it was possible to see grey or red spirals of Willy-Willys ascending thousands of feet into the blue.

Streams have deeply dissected the old land surface of the Hamersleys and the present streams exhibit "valley-in-valley" shape with steep-walled gorges such as those at Wittenoom and Dale gorges where active headward erosion is proceeding at the present time.

Yampire Gorge looked bright russet-red banded with the straw-yellow of the spinifex; here we obtained Blue Asbestos (*Crocidolite*) from an old mine and we saw the red-flowered Holly-leaved Grevillea (*G. wickhamii*) and the white-flowered variety (*G. pyramidalis*) also bushes of Petalostyles, and Cassia (*C. pruinosa*) as well as many varieties of *Ptilotus*. Here we photographed two white trunks

of *E. camaldulensis* conjoined by a stout horizontal trunk about 15 feet up.

We camped on the pebble-strewn cliff overlooking Dale Gorge, and spent most of the next morning swimming in the deep pool below the Fortescue falls.

Festooning the wet, rocky walls, was the large maiden-hair fern (*Adiantum hispidulum*) and *Cyclosorus gongyloides*. There was also the Caustic Vine (*Sarcostemma australe*) and an attractive creeping Stylidium with bright pink petals, edged with paler pink; an intense blue lobelia, (*L. heterophylla*) and a deep-purple hairy Pityrodia. We also met for the first time a sky-blue flowered member of the Borage family (*Tricodesma zeylanicum*) which we later discovered was common in the north west.

Unfortunately, large deposits of pisolitic (pea-sized) limonitic ($2\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$) ore deposits occur along the branches of the Fortescue River, including Dale Gorge, and the Circular Pool, and the alluvium-filled valleys beneath the recent detrital veneer; however we hope that the remoteness of this area from the coast may protect these beauty spots from the ore-hungry industrialists.

The cappings of mesas and terraces in the low-gradient valleys are of similar ore, which occurs in practically all drainage systems which rise in these mountains, and is already being mined at Mt. Enid on the Robe River to the north west.

Bird-life in these gorges was fairly prolific; we saw Golden Whistlers, Pied Butcher-Birds, small doves, the Forest Kingfisher and numerous finches.

The township of Wittenoom is about 33 miles north west of Yampire

Gorge and stands on the flat at the entrance to the Gorge.

The cliffs rise 800 feet above the town which at present is showing signs of decay, many houses being abandoned since the closure of the asbestos mine.

Mr. Lang Hancock who owns nearby Mulga Downs and who was the discoverer of iron in this area, has now, with Mr. Wright, formed Hanwright Pty. Ltd. and hope for future employment is returned to the remaining inhabitants of Wittenoom.

Outside the old mine gates are piles of asbestos tailings with a notice erected by the Department of Health warning people against their removal: Asbestosis of the lungs is one of the most dangerous of the chronic inhalational diseases.

George Hancock, the father of the present multi-millionaire Lang, named the gorge after the Wittenoom family, original owners of Mulga Downs.

A few miles north west along the Fortescue River valley, brought us to the narrow Rio Tinto gorge road which leads to Mt. Tom Price.

We turned east for our camp at Hamersley Gorge where the rock colours in the setting sun were more fantastically brilliant than those of Central Australia, and large, red termite mounds resembled the microcephalic torsos of Henry Moore statues.

In the cooler, shaded areas of the Gorge we found fern grottos, Cadjeputs, yellow Hibiscus with a crimson centre (*H. panduriformis*) and an apricot coloured flowering *Corchorus pachyllus* as well as River Gums and Snappy Gums.

Mt. Tom Price is another modern town with air-conditioning shopping complex, and fountains of water playing over rocks in the Square. It is

actually situated below Mount Nameless and some miles from the mining area thus avoiding the dust problem which afflicts Mt. Newman when the wind blows in a certain direction.

Some miles north of Mt. Tom Price and in front of Hamersley Station near Mt. McRae we punctured a tyre, and thus had our lunch on a shadeless red gibber plain where the rocks were too hot to pick up.

From here we followed beside the Hamersley Iron Company's standard gauge railway out towards the coast, which it reaches after 179 miles at Dampier on King Bay.

MILLSTREAM - AN OASIS ALONG THE FORTESCUE

Further west along the valley we turned south to Millstream, where a warm spring upstream in the Fortescue River is said to supply twelve million gallons of clear water per day.

Giant Cadjeputs (*Melaleuca leucadendron*) formed cool shade and luxuriant vegetation lined the banks of the deep clear water in which fish could be seen.

After digging trenches in the heat to bury piles of empty tins and bottles, left by previous visitors, our conscientious but hot and annoyed travellers swung out into the river by means of a rope tied to an overhanging Paperbark. The splash of the first swimmer caused a flight of corellas to leave screaming, and some black swans hurriedly vacated the oasis while a duck honked off upstream; but a courageous black cormorant sat unconcernedly with outstretched wings on a snag near the opposite bank.

Some 'campers' discovered some nasty-looking scorpions under their sleeping-bags next morning, but fortunately no-one was bitten.

Is it possible for birds to mistake moonrise for dawn?

I think the corellas did, as at 1.45 a.m. when the moon rose they all woke up and began their feeble, complaining gargles, and the swans flew back to the water. At 'Picaninny' daylight some ibis arrived and the cadjeputs were soon alive with small green honey-eaters with white eyes.

Along the north bank we examined the Native Cabbage Palm (*Livistonia alfredii*) and near where we slept there grew a large tree with enormous white pea flowers (*Sesbania formosa*) and wild figs grew on the high red laterite cliffs of the south bank.

NORTH TO THE COAST

Travelling north we reached the edge of the Hamersley escarpment below Mt. Herbert, and near the road we found Python Pool in which we gratefully plunged to assuage the heat. Further north we passed the fantastic Pyramid and other mesas and noted the patches of black cracked rock on which no spinifex grew, giving an appearance of recent burning.

Roebourne seemed to consist of a few tin roofs battened down with iron rods against the cyclones; pitiful but neat gardens surrounded the houses and in the streets there were bushes of *Lachnostachys*, and a form of the Rottnest Daisy, with white flowers (*Trachymene glaucifolia*).

Across the dry bed of the Harding River were neat cottages inhabited by aborigines, but their grounds were cluttered with refuse and junk of all kinds, including broken-down motor vehicles and there was never an attempt at any gardens. The hotel bar was moderately cool but the fierce dry heat outside registered 105°.

A GHOST TOWN VISITED

Across the mangrove flats we found the ghost town of Cossack, formerly Tsien-Tsien, established in 1863, where fine stone buildings stand hollow and deserted facing a well-built stone wharf abutting on the blue sea. We longed for a cool plunge, but were warned that bathing is unsafe because of sea-wasps, stone-fish and sharks.

The mangroves are of two kinds, one with stilt-like roots (*Rhizophora mucronata*) and the other with upright pneumatophores poking out of the mud (*Avicennia marina*). One of the party saw a mud-skipping fish on the mangrove flats.

We visited the neglected cemetery where Rattlepods (*Crotalaria* sp.) grew. One headstone was in memory of a doctor who died on board the ship Saladin in 1893, another was to the memory of the pioneers who had so courageously settled in this area. In 1904 there were still 150 people at Cossack, but then Point Samson became the port for shipment of asbestos from Wittenoom.

At Point Samson we saw the typically long pier so necessary in the north because of the tremendous tides; from here some copper and wool is still shipped. Nearby there is a small new settlement of the British Oil Corporation.

THE NORTH WEST COASTAL HIGHWAY

The coast along the north west is flat; mud and mangrove merge with spinifex and red sand; beside the road are red-black mounds of cracked iron-stone rock. This cracking looks like the hand of man but must be due to the natural forces of baking in the sun by day and sudden cooling during the night.

Dampier is about 30 miles west of Roebourne, and is 'Mt. Tom Price by-the-sea', as our driver so aptly said. The houses are of new brick with tiled red roofs but no guttering. It is said that each householder receives a lawnmower as part of his equipment to encourage the planting of lawns. There is an air-conditioned shopping complex with water with which we were able to replenish our depleted drinking vessels.

There was a deep-water harbour and a Japanese boat was loading iron ore from Mt. Tom Price after it had been further crushed to about quarter inch size. More than 20,000 tons per day are shipped from here at present and the amount will increase. Hamersley Iron Pty. Ltd. plans to build here the largest metallised agglomerate plant in the world.

A few miles further west we found a patch of melaleucas and a few eucalypts beside a sluggish, reedy river—the Maitland, source of Dampier's present water supply. One of the party caught a large catfish with long whiskers here.

We slept in lines like a dormitory on the red dusty banks of the river which provided fairly level ground; a faint pump worked further upstream and due to our proximity to the sea a dew descended overnight causing the red dust to set in small cakes on our sleeping gear.

The vegetation along the coast is rather uninspiring. It consists of some patches of acacia, some grevilleas, corkwoods and eremophilas, and lots of ptilotis, mostly pale yellow-green, but as we again crossed the Fortescue River we came upon a magnificent bean-tree (*Erythrina verspertilio*) covered with scarlet flowers.

Near Yarraloola we crossed the Robe River which drains the Brockman Iron Formation including Tom Price. This western end of the Hamersleys seems to contain the most extensive deposits of pisolitic iron measurable in thousands of millions of tons of ore containing more than 50% iron.

These deposits are terraced along the walls of the narrow gorges, where pisoliths are often mixed with haematite-goethite conglomerate.

The pisolite also caps the mesas in a thickness of about 50 feet and can be seen as a dark spinifex free cap.

Pisolitic ore in this area is said to be higher in silica and alumina than the haematite ore at Tom Price but is lower in phosphorus; it is believed that pisolitic ore represents the end-product of weathering and desilication of jasperlite transported down the river systems, during the long period of erosion.

INTO THE ASHBURTON DISTRICT AGAIN

Duck Creek drains the western Hamersleys to the south, before flowing into the Ashburton. This area also has similar pisolitic ore deposits.

We by-passed Onslow, which was said to be 'very like Roebourne' by leaving the coastal highway at Peedamullah and passing through Nanutarra where the Ashburton River is crossed, and here were some River Gums (*E. camaldulensis*), Snappy Gums (*E. brevifolia*) and several others. The flat red plains were often covered with Mitchell Grass (*Astrelba pectinata*) and were said to carry a few sheep. There were no fences, however, and this area has a summer rainfall of less than ten inches and looks like it! We saw stands of Mulga (*A. aneura*)

and occasional Whitewoods (*Atalya hemiglauca*) and Ironwoods (*A. estrophrolata*).

Around Yannarie we passed through Coolibah country (*E. microtheca*) and saw a few brown-centred Sturt's Desert Pea.

SOUTH FROM THE TROPICS

Just north of the Minilya River the road crosses the tropic of Capricorn and leaves the spinifex plains for a mixed wattle scrub. We passed through a series of red sand hills which were most floriferous and it would have been interesting to have explored every one — as it was, we found pink feather-flower (*Verticordia forrestii*), blue hibiscus (*Pinonianis*), the calyces only of pink calythrinx mucronata, as well as white grevillea (*G. pyramidalis*) and golden *Grevillea stenobotrya*, and furry lilac *Pityrodia loxocarpa*.

Near the river we discovered a small air-conditioned road house selling iced drinks and we descended like locusts and drank and drank.

South of the river the road was sealed and we made the 91 miles into a caravan park at Carnarvon in 1 hour and 20 minutes. All that I managed to see was the wide, sandy waterless bed of the Gascoyne River, where small 'spear' pumps are used to tap the millions of gallons of fresh water below the sand to maintain heavily-planted banana plantations, which grow on the flats here, not on hill slopes as at Coffs Harbour, N.S.W.

The big 'dish' of the satellite tracking station is visible from a long way out on the plains; next day we toured the station which is built on a series of low red sandhills called the Brown range. They told us that Carnarvon is exactly 180° from Cape Kennedy,

U.S.A., and that a hole bored directly down through the earth's centre would come out here.

CARNARVON TO SHARK BAY

The road south ran straight along a hot sandy saltmarsh, with some mulga scrub for about 120 miles when we re-crossed the 26th Parallel and so officially left the north-west. At the 490 mile post we found another road house and repeated the locust act. Here was a solar distilling plant for the production of fresh water from salt water and the outhouses were made of blocks of white shell-conglomerate which we later found was cut from the dunes of Hamelin Pool which forms the eastern arm of Shark Bay where we made our next camp.

Near the Hamelin Pool Station homestead is an artesian bore which has formed a fresh water lake surrounded by vegetation. Here we saw swans and their cygnets, pied duck, banded stilts, and silver gulls, and lying about were bubbly looking red stones, which when cracked revealed rainbow chalcedony, some with red blood-like veins.

To our surprise we found a lonely post-office behind the dunes and on asking the Postmistress why a post-office should be situated there, she said she had no idea, but it had been there for 80 years.

The sea at Hamelin Pool was very shallow and salty and a white cloudy flocculate formed with each step. We were warned about sea-serpents and so did not venture further than a cooling dip in the shallows. There was a hot breeze at night as we slept on the dunes and at dawn some small invisible birds in the coastal vegetation called to each other very distinctly 'I said I would do it'!

SOUTH TO THE HEATH SCRUB OF KALBARRI

As we drove south towards the Murchison River crossing at Galena, the sand-plain flora began to appear. There were waving pale yellow *Grevillea leucopteris*, orange *Grevillea erios-tachya*, and whitish *Grevillea dielsiana*; the Acorn Banksia (*B. prionites*), blue dampiera sp. and scaevola and copper cups (*Pileanthus peduncularis*). There were bushes of apricot and green geleznovia, lilac hibiscus, red calothamnus and sheets of pink *Helichrysum casiniana*, and some almost dead yellow and white cephalipterum.

CONCLUSION

Our next night was spent at Red Bluff on the coast a few miles south of Kalbarri, where the flora of the sandy scrub is so abundant, colourful and exciting that a whole article could be written on this area alone.

As I anticipate that such an article will be forthcoming from members of the F.N.C.V. who visited this area about one week previously, I shall bring my journal of the amazing north west to its conclusion.

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Botany Group Announcements

Thursday, 12 March.

Speaker: Mr. J. Willis.

Subject: Botanical Personalities of Australia.

Thursday, 9 April.

Speaker: Miss M. Lester.

Subject: Myrtaceae.

Excursions

Sunday, 8 March.

Mt. Ben Cairn (Healesville to Mt. Donnabuang Road). Meet at Healesville Comfort Station at 10.30 a.m.

Preliminary Notice

Sunday, 12 April.

Macedon area. Details and time to be arranged at March meeting of Botany Group.

Geology Group Excursions

Sunday, 22 March—Geology Group Excursion to Tullamarine (Albion—Reid's Quarries) and Bulla (Deep Creek). Leader—Mr. R. R. Dodds. Transport by private car (spare seats available). Leave Flinders Street, opposite C.T.A. Building, at 9.30 a.m. Bring one meal.

Sunday, 5 April—Geology Group Excursion to Waurin Ponds (limestone quarry) and other localities in Geelong area. Leader—Mr. Stan Rowe. Transport by private car (spare seats available). Leave Flinders Street opposite C.T.A. Building at 9.30 a.m. Bring one meal.

Sunday, 10 May—Geology Group Excursion along Maribyrnong River. Leader—Mr. D. McInnes. Transport by private car (spare seats available). Leave Flinders Street, opposite C.T.A. Building at 9.30 a.m. Bring one meal.

Ninetieth Annual Report

1969

Field Naturalists Club of Victoria

Nineteen sixty nine will go down as the year that conservation came of age, and was seen by government and politicians as having magical associations with the people and the polls.

The public have suddenly become aware of the fast vanishing bushland and in this awareness make demands that find us hard-put to maintain a balance between the study of natural history and conservation and its various campaigns. It was expected that we would give advice; expected that we would have a part to play.

Indeed it was ever so: ninety years of study, publishing, and advising have made us Nature's *Alma Mater*.

Inevitably secretarial duties have suffered, and reconstruction of the organisation will be necessary to meet the challenge that care of the environment and the study of ecology will impose. More Group Projects are needed; more leaders and an eagerness on the part of members to come forward and be counted among the active ones.

Membership

Ordinary members 440, Country 240, Juniors 18, Subscribers 144, Affiliated Clubs 29.

Of special interest is the entry of the La Trobe University Conservation Society into the ranks of affiliated clubs and we wish them well for the future. Of particular sadness was the death of Mr. R. W. McKellar who together with his wife had for a number of years been on the committee of the Churchill National Park; and the passing of Mr. K. C. Halafoff, a constant contributor to the magazine. He was well known for his articles on Lyre Birds.

Congratulations go to Mr. Bond and Miss Missen for achieving Honorary Membership.

Books

This year saw the success of *Flowers and Plants of Victoria*. Published by A. H. & A. W. Reeds in association with the F.N.C.V. it has added to our funds considerably, and our congratulations go to the co-authors Messrs. Cochrane, Fuhrer, Rotherham and Willis. Also out this year, published by ourselves, was an index to Vol. 1 & 2 of *Wildlife* at 30 cents.

In the melting pot are further books, two on flora and one on birds.

Nature Show

Held in conjunction with the S.G.A.P. and B.O.C., this was as popular as ever and eagerly looked forward to by a large number of people. 3813 adults and 3095 children went through the turnstiles. This was a far larger attendance than the previous year which had been affected by the opening of the new art centre.

The Bird Observers had the responsibility of the three dioramas which were the central attraction, the theme of which was 'Birds of Melbourne Suburban Home Gardens', 'Birds of the Botanical Gardens', 'Birds of the Beaches'.

Of special interest was the number of junior clubs taking part. As well as the well established Hawthorn Juniors there are the up and coming Preston, the newly formed Montmorency, and the small but vigorous Pascoe Vale clubs. The display of native plants in flower was, as always, tremendous.

Medallion

The committee revised the rules to facilitate the administration of the award and it will now be possible to make the award at a set time of the year at the November General Meeting in Melbourne. The 1968 award was made to Dr. Norman B. Tindale, formerly Curator of Anthropology at the South Australian Museum and visiting Professor at the University of California.

The 1969 award went to Charles A. Gardner of Western Australia, and it is unfortunate that he has had to forego the traditional award ceremony. He was formerly Government Botanist.

Wildlife & Conservation

As usual we have been dividing our activities between the two. Again we appear to have been successful in keeping the Wombat off the vermin list, while at the same time came the welcome news that that awful pest *Chrysanthmoides monoliferum* (South African Bone Seed — Jungle Weed), or whatever you like to call it, has at long last been put on the list of noxious weeds. Our concern at the moment is for some of the smaller animals like Mitchell's Hopping Mouse, which may be in danger because of recent popularity in the press. We have even heard of people digging up their habitat just to photograph them. We also hope to get the locality of the recently rediscovered orchid *Calochilus richae* protected (reference November *Naturalist*).

The success of the Little Desert issue could well have strengthened conservation, by leaving as a legacy the Bushlands Action Committee, and The Conservation Advisory Panel,

which together with the newly formed Conservation Council of Victoria, make an impressive line up for the future. However, let us not feel complacent; the Glenelg still needs to be resolved and a new National Park an urgent requirement for our Alpine areas. Other issues still to be resolved are Warrandyte State Park; Gemmells Swamp, a major breeding ground for the Ibis; and Parks for the Brisbane and Otway Ranges to mention only a few.

For the future here is the question put to an overseas conservation panel discussing the Politics of Ecology. The answers may well have an application here.

"What specifically, can the concerned citizen do?"

The Panel agreed on the following: Stop acting as an individual.

Environmental problems are still so new as political issues that they must be patiently explained to legislators — preferably before formal hearings. Every environmental cause must be directly equated with votes for the legislators.

Proposals should call for positive action rather than negative action.

Once bills start moving through the legislative machinery, their progress should be widely publicized.

Library

The library received an unexpected addition with the donation of some parts of Bronofskis 'Birds of Australia', which helps to make the parts that we already have more complete.

This, together with the gift of a volume of Cassels 'Birds', came from Mr. S. M. Callaghan of Lorne.

Flowers and Plants of Victoria in Colour

Copies of this excellent book are still available, and of course would make a wonderful gift. They are obtainable from the F.N.C.V. Treasurer, Mr. D. McInnes.

March, 1970

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FIELD NATURALISTS CLUB OF VICTORIA

BUILDING FUND

Amount of Fund at 31st December, 1968	\$3,104
Interest on Investment and from Bank Account	154
	<u>\$3,258</u>
Less Amount transferred to General Account for payment of part rent	155
Amount of Fund at 31st December, 1969	<u><u>\$3,103</u></u>

PUBLICATIONS FUND

Amount of Fund at 31st December, 1968	\$4,298
Surplus for the year from—	
Ferns of Victoria and Tasmania	\$34
Victorian Toadstools and Mushrooms	24
Vegetation of Wyperfeld National Park	28
	<u>86</u>
Interest on Special Bonds and Bank Account	132
Amount of Fund at 31st December, 1969	<u><u>\$4,516</u></u>

CLUB IMPROVEMENT ACCOUNT

Amount of Account at 31st December, 1968	\$538
Nature Show Profit	400
Profit on Booksales	113
	<u>\$1,051</u>
Less Books purchased for Library and 3 spare lamps & 1 projector pointer ..	14
Amount of Account at 31st December, 1969	<u><u>\$1,037</u></u>

General Meeting, 9 February

About 190 members and friends attended and the President Mr. E. R. Allan was in the chair.

The minutes of the meetings on 8 December and 12 January were taken as read. The secretary was welcomed back. A letter was received from Mr. E. T. Muir asking the club to take action about making secure the habitat of the Mitchell's hopping mouse which has been relocated in the

Little and Big Deserts after it was thought to be extinct. Collectors for export in the Commonwealth and Overseas are securing them and it is feared they may soon exist no longer. They should be on the protected list. Mr. Garnet moved that the matter be taken up by the council for sympathetic consideration. Mr. Swaby seconded the motion. The President said it was for the Chief Secretary's department to consider and to declare

it to be a protected animal. They would refer it to the Fisheries and Wild Life Department. Mrs. Woollard said that one animal had been sent to Melbourne for the Sanctuary but it had been killed and stuffed.

The Secretary has been contacted by Mr. Charles Fleming of Macedon asking for the Club to supply names of members in the Macedon area for help to try to prevent extensive subdivisions in the Macedon region and to help secure a National Park on Mt. Macedon where there are Koalas and natural vegetation.

The F.N.C.V. would like to know where the subdivision is taking place. Anyone living in that area is asked to get in contact with Mr. Fleming.

The Secretary also announced that there is to be a meeting of the Conservation Council of Victoria at Tatura on 25 March to consider making the swamp at Mooroopna into an aquatic sports lake. The Conservation Council appears to hope to get the birds to transfer to another swamp. Two representatives of the F.N.C.V. are invited to the meeting but it is hard to get anyone there at that time to give the Club's views on that regrettable proposal. The President announced that Mr. Ernest H. Homan had been a member of the F.N.C.V. for over 42 years and is President of the Latrobe Valley F.N.C. and formerly of Bairnsdale Club. The Council recommended him for honorary membership. The meeting heartily endorsed this and Mr. Homan was presented with the Certificate of Honorary Membership.

In responding, Mr. Homan recalled the early days in the Wonthaggi district where in the heathland between the road and the sea there were acres of wallflower orchids, numbers of

spider orchids, and with Mr. Dick Bond he listed over 90 species of orchids in the district. He found the rare endemic *Thelymitra murdochae*. He joined the club on the proposal of Mr. Pescott, and in Melbourne attended club meetings regularly, and after being in St. Arnaud returned to Gippsland. He was a foundation member of the Bairnsdale Club and is president of the Latrobe Valley Club. He regretted the 1,000 acres of *Pinus radiata* now in Gippsland. There, no birds sing or flowers grow. He stressed that now is the time for conservation to be active—the main objective of the club.

The President then gave his last report as follows:—

As this is the last meeting of the Club which I shall attend this year, and as your retiring President, I thought that perhaps it would be appropriate if I made a few remarks on the affairs of the Club at this point.

I think that we have once again had a successful year of activity in 1969.

Our General Meetings attended usually by approximately 150 members and visitors have covered a wide variety of subjects, and the exhibits have been interesting and informative.

The five Club Groups—covering Botany, Geology, Microscopical Research, Mammal Survey, Entomology and Marine Biology, have each held regular monthly meetings and many field excursions.

We have had general Club excursions to 17 different places, including one to W.A. and one to Mt. Beauty, all of great interest and enjoyed by members, apart perhaps from the one to Churchill National Park.

We held our Annual Native Show at the Lower Melbourne Town Hall,

and once again it was a great success—an innovation being the B.O.C's staging of the central exhibit and making a very good job of it.

We have continued to publish the *Victorian Naturalist*, maintaining its high standard of articles and format. A change of printers occurred owing to a considerable increase in charges by Brown Prior Anderson who have printed the *Naturalist* for us for the past 38 years. After a considerable amount of investigation and discussion by a sub-committee set up by Council arrangements were made with Jenkin, Buxton & Co. to print the *Victorian Naturalist* at approximately the same cost as applied before the increase made by Brown Prior. The Club is deeply indebted to Mr. Grif Ward, our Editor, who negotiated with the firm and who took such care to have the change-over occur with the minimum of inconvenience to the Club. However Council is concerned at the strain this publication makes on the Club finances despite a subsidy from the M. A. Ingram Trust. The high rate of subscription necessary to cover printing costs has I believe resulted in some members feeling compelled to resign. It may well be that before long, we shall be compelled to cease the monthly publication which has continued virtually unbroken for the past 87 years—a great achievement—and perhaps issue the *Naturalist* every two months instead of monthly.

In co-operation with other organisations we have endeavoured to carry out the other part of the objects of this Club—i.e., to preserve and protect Australian Fauna and Flora, notably in respect of proposed Lower Glenelg National Park, Little Desert, Warrandyte Reserve, Glenwills Swamp and others.

The M. A. Ingram Trust, of which three members of this Club are Trus-

tees, has arranged to pay the cost of over 3,000 acres of virgin Mallee country at Wandown, east of Annuello. This is the last remaining area of Mallee in five thousand square miles of sheep and wheat farms in Swan Hill Shire and the purpose will primarily be to preserve the Lowan. In a survey conducted by the Mid-Murray F.N.C., over 70 mounds were found—21 of them working. This was in June last year, but of course it will provide a sanctuary for emus, parrots, and many other species.

Having regard to the foregoing, and I haven't covered everything, no one could say that we are not an active Club, and I feel that all of you who have contributed in any way, however small to what we have achieved, are to be congratulated and thanked, but particularly our Secretary, Treasurer, Editor and Excursion Secretary.

We could do with more young people having a say in Club affairs, and perhaps next year members will look around to see which of our younger members could be elected to Council.

In conclusion I should like to thank you for doing me the honour of being your President. Although I haven't been able to participate in the Club's activities as much as I had hoped it has been a privilege to be President of the F.N.C.V.

All good wishes for greater success in 1970.

The Secretary reported that Mr. Charles Gardiner was still so ill, there was no hope of a bedside ceremony to present the 1967 Medallion, but he had been made aware of the award.

The subject for the evening was "Through the Kimberleys" by Mr. Alan Morrison. A map showed the

extent of the 10,000 mile trip for three cars and two caravans, taking three months, through Port Augusta, Alice Springs, Devil's Marbles, Mataranka, Darwin, back to Katharine, Timber Creek, Kununurra, Hall's Creek, Fitzroy Crossing, Geike Gorge, Broome, Pt. Hedland, Marble Bar, Millstream, Carnarvon, Geraldton, Mt. Magnet, and back to Jurien Bay. Excellent colour slides showed the diversity of the changing scene, from the silicious jasper and agate gibber stones, bright pink Euphorbia and Frankenia flowers, dry water courses with River Red-gums, deep lilac *Eremophila willsii*, friendly wild donkeys, Ghost Gums and granite tors of the Devil's Marbles, Major Mitchell Pink-crested Cockatoos, Topknot Pigeons and the cemetery of the Elsey station where most of the characters of "We of the Never Never" are buried

At Mataranka we saw the 80°F spring making a pool emptying into the Waterhouse Creek, and the Roper River showed pink-purple water lilies.

Seven inch golden orb spiders, lovely yellow *Hibiscus panduriformis*, pale yellow *Grevillea dimidiata*, the colourful Pinkerton Range, red *Brachychiton paradoxa*, golden yellow *Cochlospermum*, and a remarkable leguminous plant with strange catkins with yellow stamens of male flowers above and white female flowers below—*Dicrostachys spicata*—and the beautiful Victoria River Crossing, gave an idea of the strange and fascinating country. Various types of termite mounds were found in different areas. Near Timber Creek, a species of Terminalia tree with tessellated bark bore quandong like fruits demonstrated by an aborigine as edible. Most Terminalia species have winged fruits.

The diversion dam at Kununurra abounds in bird life and basking crocodiles. The mangroves of Wyndham, a strange woolley sundew near Hall's Creek, 10-15 feet high pink *Calytrix microphylla*, red flowered Bauhinia trees, flat top mountains, Fitzroy Crossing with a concrete causeway, and the beautiful limestone cliffs showing fantastic shapes in Geike Gorge were all shown.

A pied butcher bird and a triumphant shot of Ian Morrison with two big Barramundi livened the scene. Acacias abounded—40 or 50 different species, one with red to chocolate flowers. At Derby the Civic Centre showed a bottle tree. These baobabs are extensively distributed. One showed an opening in the side. This is said to have been a jail. One slide showed a large creamy flower of a baobab tree. At Broome, an old pearling lugger rested high and dry on the mangroves. A foot-print of a dinosaur, 30 yards out from the shore—left 120,000,000 years ago—was shown in the sandstone.

From Broome to Port Hedland, a corrugated 400 mile stretch has no water or provisions. Slides showed blue *Cyanostegia*, purple-pink *Callandrinia*, white *Capparis lasianthos*, cream *Hakea lorea*, and Sturt's Desert Pea with a variety of coloured centres. A thorny dragon—*Moloch horridus*—proved photogenic.

Marble Bar presented a fine figure of an aborigine host-cum-guest at the jail. Beautiful streaky coloured banding showed in the jasper cliffs.

Dale's Gorge scenes revealed 4-500 feet deep brilliant red cliffs and green water below. One river gum showed self grafting in its boughs.

The Robe River had magnificent paper bark trees, *Melaleuca leucodendron*.

As the journey continued from Ashburton River to the Murchison, slides showed ever changing colour and form of flowers: red, round heads of *Gomphrena*, violet *Swainsona occidentalis*, purple-violet *Ruellia primulacea*, pink *Grevillea petrophilioides*, creamy *Anthocercis littorea*, red *Hakea bucculenta*, blue-purple *Stemodia grossa*, pale yellow *Grevillea dimidiata*, a red beady *Darwinia* and *D. neildiana*, lemon *Melaleuca cardiophylla*, blue *Caladenia gemmata*, pinkish-violet *Melaleuca radula*, *Hakea orthorrhynchus* with birdlike capsules, low 15 inch high *Banksia laricina*, golden *Dryandra*, scarlet *Grevillea dielsiana*, and brilliant red *Verticordia grandis*.

The President thanked Mr. Morrison, and members showed their appreciation of the interesting talk. Mr. Ian Morrison projected the slides. Mr. D. McInnes complimented the editor, Mr. Grif Ward, on the current Naturalist and its contents.

Exhibits

Miss K. Hall showed a drawer, one of a pair belonging to a table in a shed with earthen floor at Balnarring. The owners left towels in one drawer and tissues in the other. A mouse—probably a yellow footed marsupial mouse—*Antichinus flaviceps*, made her nest of leaves and tissues from the next drawer. She had several young.

Mr. T. Sault brought fossil leaves in Oligocene under basalt from Bundarra River and partly silicified wood—probably Hoop Pine from Bundarra River (Oligocene).

Mr. A. J. Swaby showed *Fratia surrepens* (alpine Pratia—Lobeliaceae) and *Persoonia pinifolia*.

A huge larva of White-stemmed Gum Moth, *Chelepteryx collesi*, was displayed as well as two longicorn beetles and a robber fly.

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F.N.C.V. DIARY OF COMING EVENTS

GENERAL MEETINGS

Wednesday, 11 March—Annual Meeting at National Herbarium, The Domain, South Yarra, commencing at 8 p.m.

1. Minutes, Reports, Announcements.
2. Correspondence.
3. Subject for the evening—"Conservation 1970"—Speakers: Ros. J. Garnet, Reg Johnson (B.O.C. Pres.), David Lee (F.N.C.V.).
4. New Members.

December '69; January '70

(a) *Ordinary:*

Mr. Ross Burgess, 13 Otterington Grove, East Ivanhoe, 3079. (Interest: Geology.)
Mr. William A. Davis, 39 Fairlie Avenue, Macleod, 3085. (Interest: Ornithology & Nature photography.)
Miss Alison E. Fraser, Flat 11, 11 Raleigh Street, Windsor, 3181. (Interest: Entomology.)
Mr. Robert J. Lawson, 8 Gwenda Avenue, Moorabbin, 3189. (Interest: Conservation of Australian Birds & Animals.)
Dr. Margaret McLeod, Royal Park Receiving Hospital, Private Bag 3, Parkville, 3052. (Interest: All Naturalist Studies.)

Joint Ordinary:

Mrs. R. Kelly & Master Andrew Kelly, 4 Trawalla Avenue, Toorak, 3142.

(b) *Country:*

Mr. John E. Jamison, 37 Dawes Road, Kyabram, Vic., 3620. (Interest: Conservation of flora & fauna.)
Mr. Thomas McK. King, Esmonde Street, Rushworth, Vic., 3612. (Interest: Conservation of flora & fauna.)

(c) *Junior:*

Mr. L. G. Hodgson, "Cambina", Calder Highway, Keilor, 3036.
Mr. Michael D. Howes, 100 Walpole Street, Kew, 3101. (Interest: Geology.)

5. General Business.
6. Nature Notes and Exhibits.

Monday, 13 April—Speaker: Helen Ashton.

F.N.C.V. EXCURSIONS

Sunday, 15 March—Lal Lal. The coach will leave Batman Avenue at 9.30 a.m. Fare: \$2.00. Bring two meals.

Easter: 27-30 March—Warrnambool with trips to Tower Hill, Port Campbell, etc. A coach has been chartered for this period and motel accommodation booked for coach party at \$6.50 per day for dinner, bed and breakfast. This is to be paid individually by members and the coach fare of \$15.00 should be paid to the excursion secretary when booking, all cheques to be made out to Excursion Trust. The coach will leave Flinders Street outside the Gas and Fuel Corporation at 9.00 a.m., Good Friday.

GROUP MEETINGS

(8 p.m. at National Herbarium unless otherwise stated.)

Thursday, 12 March—Botany Group. Mr. J. H. Willis will speak on "Botanical Personalities in Australia".

Wednesday, 18 March—Microscopical Group.

Wednesday, 1 April—Geology Group.

Thursday, 2 April—Mammal Survey Group at Sir Arthur Rylah Institute for Environmental Research, corner of Brown St. and Stradbroke Ave., Heidelberg.

Friday, 3 April—Montmorency District Junior F.N.C.

Monday, 6 April—Entomology and Marine Biology Group meeting at 8 p.m. at the National Museum, Russell Street, Melbourne.

Thursday, 9 April—Botany Group—Myrtaceae, by Miss M. Lester.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.

Patron:

His Excellency Major-General Sir ROHAN DELACOMBE, K.B.E., C.B., D.S.O.

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Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available, and other activities are indicated in reports set out in the several preceding pages of this magazine.

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Vol. 87, No. 4

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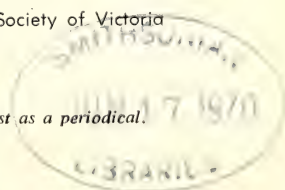
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The Feather-tail Glider (*Acrobates pygmaeus*) is the smallest species of Glider; its overall length being about 6 inches (15 cm) of which the tail forms half this total. Because of its size and nocturnal habits, it is rarely seen; but is in fact fairly common over its wide distribution from Cape York to Victoria and S.E. South Australia. Photo: W. H. King.

The Victorian Naturalist

Editor: G. M. Ward

Assistant Editor: P. Gahan



Vol. 87, No. 4

8 April, 1970

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Front Cover:

Flocks of Budgerigahs coming to drink at a waterhole beside The Bitumen, north of Alice Springs.
Photo: Graham Pizzey.

Two New Whale Records from Victoria

Mesoplodon bowdoini Andrews (Ziphiidae) and
Balaenopteraedeni Anderson (Balaenopteridae).

by JOAN M. DIXON*

Summary

In 1968 two whales belonging to species hitherto unknown from Victorian waters were stranded on the Victorian coast to the south west of Melbourne. These have been identified as the beaked whale *Mesoplodon bowdoini* (Andrews' Beaked Whale) and the baleen whale *Balaenopteraedeni* (Bryde's Whale).

Mesoplodon bowdoini Andrews, 1908, Andrews' Beaked Whale. (Plates 1-4.)

* Curator of Vertebrates, National Museum of Victoria.

This specimen, an adult female, was washed up on the beach near Hordern Vale at the mouth of the Aire River (Lat. 38°47'S, Long. 144°23'E) in May, 1968. Photographs taken by local schoolteacher Mr. K. Taylor, and by Mr. C. Marriner of Hordern Vale were sent to Mr. N. A. Wakefield of Melbourne. He recognised the specimen as a beaked whale and contacted me about this matter. I visited the locality on 13 May, 1968. By this time local residents had buried the whale in the sand, but it was possible



Plate 1

Mesoplodon bowdoini (Andrews' Beaked Whale) female, stranded at Hordern Vale, Victoria, May, 1968. Nat. Mus. Vict. reg. no. C8442.

Photo: K. Taylor.

to uncover, examine and photograph the head. The tongue was badly swollen, which made examination of the jaws difficult, but as far as could be determined at that stage, the specimen was a beaked whale, *Mesoplodon* sp. No teeth could be felt projecting through the gumline of either jaw. In July, 1968, I returned to the area and with the assistance of Mr. Marri-ner removed the head from the body, and rough-cleaned the skull. It was badly fractured, the rostrum broken

off from the main part of the cranium, pterygoids fractured, and mandibles shattered, particularly in the region of the angle. The skull was taken to the museum and preparation completed. The presence of a single pair of mandibular teeth was noted. The position of each tooth, near the posterior union of the symphysis, and the shape of each tooth indicated that the specimen was a female *Mesoplodon bowdoini*.

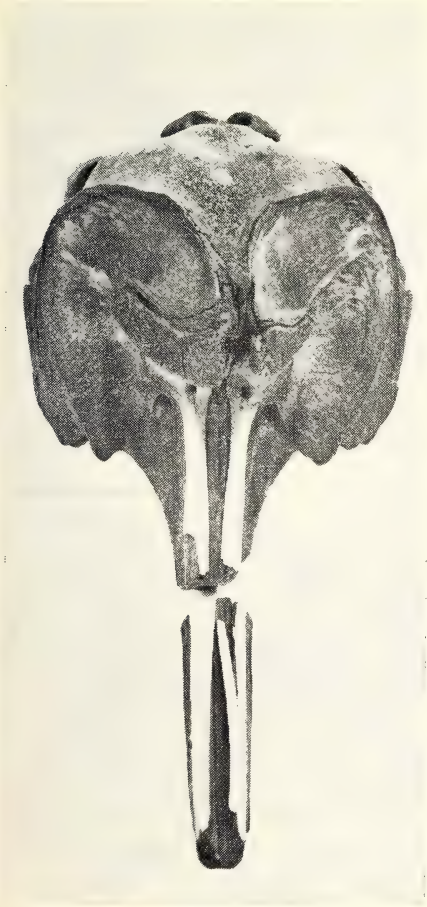


Plate 2
Mesoplodon bowdoini C8442. Dorsal
view of skull.

Photo: F. Guy.



Plate 3
Mesoplodon bowdoini C8442. Ventral
view of skull.

Photo: F. Guy.

The rest of the carcase was left to decompose in the sand and the site was revisited in December, 1968. By this time the shifting sand had uncovered some of the caudal vertebrae, and it was possible to recover a large proportion of the skeleton. Skull and skeleton are now housed in the National Museum of Victoria, registered No. C8442.

Measurements in cm.

Body length 394 (taken by Mr. K. Taylor, May, 1968.)

Skull dimensions:

Maximum length	68.5*
Maximum length of rostrum (tip to line connecting antorbital notches)	38.5*
Tip rostrum to anterior margin superior nares	47.0*
Maximum breadth across zygomatic processes of squamosals	34.7
Maximum breadth foramen magnum	10.7
Maximum breadth across exoccipitals	28.6
Width rostrum in apices antorbital notches	20.6
Width rostrum in apices prominential notches	16.2
Maximum transverse width of superior nares	4.8
Least distance between maxillary foramina	7.7
Least distance between premaxillary foramina	3.8
Maximum depth at occipitals	34.0
Maximum depth at pterygoids	27.4*
Width rostrum (middle)	5.7
Depth rostrum (middle)	7.4
Length mandibular symphysis	11.31*

(*indicates that measurement is incomplete due to skull damage).

Tooth measurements (tooth from right mandible)

Height at anterior face 6.1 cm.

Height at posterior face 5.02 cm.

Length of base 4.78 cm.

Remarks: Guiler (1967) has recorded a skull of *M. bowdoini* from Marion Bay, Tasmania. Gaskin (1968) mentions that in the Southern Hemisphere, *Mesoplodon bowdoini* has been recorded from New Zealand as far south as Stewart Island and from Bunbury, Western Australia (Glauert, 1947). The above Hordern Vale specimen appears to constitute the first Victorian record of this species..

Bryde's Whale *Balaenoptera edeni* Anderson 1878. (Plates 5-8.)

On 25 July, 1968, another whale was stranded on the Victorian coast, on this occasion at the mouth of Limeburner Creek, Corio Bay, (Lat. 38° 04'S, Long. 144° 24'E).

It was examined by Mr. R. Bickerdike of the Geelong Church of England Grammar School, who took photographs, made observations and measurements. The following information was supplied by Mr. Bickerdike.



Plate 4

Mesoplodon bowdoini C8442. Lateral aspect of tooth from right mandible.

Photo: F. Guy.



Plate 5

Balaenoptera edeni (Bryde's Whale) young male, stranded at Corio Bay, Victoria, July 1968. Nat. Mus. Vic. reg. no. C8441.

Photo:

R. Bickerdike.

"Tip of snout to centre of flukes	21'
Tip of snout to dorsal fin	13' 8"
Tip of snout to flippers	6'
Length of flipper	2'
Width across flukes	4' 10"
Approximate girth (by flippers)	9' 6"

Dorsal side was a blue-grey while the non-pigmented area on the ventral side extended through to the tail. There was no ridging on the back. Flippers were blue-grey above and grey-white below. Ventral grooves extended as far as the navel. I could not detect any slit in the hinder margin of the dorsal fin."

From the photos taken by Mr. Bickerdike and officers of the Fisheries and Wildlife Department, the three longitudinal ridges on the snout indicated that this was a Bryde's Whale *Balaenoptera edeni*. The specimen was a young male.

The skull and the baleen plates were obtained for the museum collections, registered No. C8441. The baleen plates numbered approximately 260 on each side. They were grey-black in colour with yellowish-white bristles, the longer ones being fairly stiff, thick and uncurled. The largest plate was 12.5 cm. long excluding bristles, and 10 cm. wide at the base. Bristles on the baleen were somewhat finer than those on specimens re-

corded from Western Australia by Chittleborough (1959). However, Chittleborough and Dawbin (pers. comm. 1968) concurred in the opinion that the specimen was a Bryde's Whale and attributed the fineness of the baleen to the fact that the specimen was a juvenile.



Plate 6

Balaenoptera edeni C8441. Dorsal view of head showing the three diagnostic longitudinal ridges.

Photo: R. Bickerdike

Skull measurements in cm.

Length of skull from posterior margin of condyles to tips premaxillae	139
Greatest breadth of skull	61
Breadth of rostrum basally	36
Anterior margin of nasals to tips of premaxillae	83.5
Length of premaxillae	92
Length of nasals mesially—	
right side	10
left side	10.5
Length of nasals laterally—	
right side	13
left side	13

Breadth of nasals, anteriorly—

right side	4.5
left side	4
Maximum height of skull	32
Length of mandible	124
Depth of mandible	19

Remarks: This is the only known record of *Balaenoptera edeni* from eastern Australia. The species has been recorded from Shark Bay, Western Australia, by Chittleborough (1959). Gaskin (1968) mentions several New Zealand records, none of these occurring further south than East Cape, Lat. 37°30'S. Long. 178°30'E.

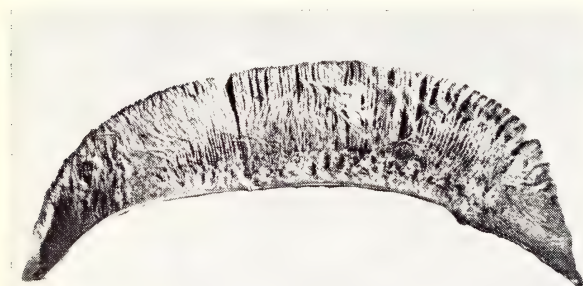


Plate 7

Balaenoptera edeni C8441, entire baleen of one side.

Photo: F. Guy.

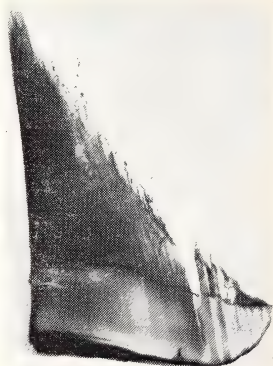


Plate 8

Balaenoptera edeni C8441. Single baleen plate.

Photo: F. Guy.

Acknowledgments

The author wishes to acknowledge the contributions of the following persons to the preparation of this paper: Mr. and Mrs. C. Marriner of Hordern Vale, Victoria; Mr. K. Taylor; Mr. A. J. Coventry, Nat. Mus. Vict.; Mr. N. A. Wakefield of Monash Teachers' College; Mr. R. M. Warneke of the Fisheries and Wildlife

Department, Melbourne; Mr. C. McCann, Wellington, New Zealand; Mr. R. Bickerdike, Geelong Church of England Grammar School; Dr. W. Dawbin, University of Sydney; Dr. G. Chittleborough of the CSIRO Division of Fisheries and Oceanography.

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Geology Group Excursions

Sunday, 5 April—To Waurin Ponds and other localities in the Geelong area.
Leader—Mr. Stan Rowe.

Sunday, 10 May—To Airey's Inlet. Leader—Mr. George Carlos.

Sunday, 7 June—To Maribyrnong River Terraces. Leader—Mr. Dan McInnes.

Transport is by private car (spare seats available). Excursions leave from the western end of Flinders Street Station, opposite the C.T.A. Building, at 9.30 a.m.

Silica Minerals

BY M. J. MOONEY

Anyone interested in minerals need never be concerned by the saying "Small things amuse small minds", for minerals are the building blocks of this our Earth.

Geologists who have studied the Earth know that the outer skin at least, consists largely of silicon and oxygen. These elements are combined in many ways, but one of the most important is as silicon dioxide *silica*; this occurs in many forms, some of which are very beautiful as well as being of great use to man. (See Fig. 4).

Silica is a very stable chemical compound which can exist over a very wide range of temperatures and pressures. However, the silicon and oxygen atoms may combine in different ways, each silica mineral representing one particular *phase* or arrangement of atoms.

Sometimes the temperature and pressure of a mass of silica may change very rapidly; so rapidly in fact that the molecules do not have time to become rearranged in the pattern that is most stable under the new conditions. In such cases the original mineral is present outside its normal range of temperatures and pressures—it is present as a *metastable* phase. A metastable phase will eventually alter to a more stable form but the time required may vary from a few minutes to many hundreds of years. Ordinary glass is a metastable material and, over a period of many years, will tend to crystallise or devitrify.

At ordinary temperatures and pressures, *low-quartz** is the stable form of silica. As the temperature rises above 573°C. (degrees Centigrade), the molecules become slightly rearranged with respect to each other, forming *high-quartz*. At 870°C., a further change occurs, and *tridymite* becomes the most stable form of silica. At 1470°C., the silica molecules become rearranged once more, forming *high-cristobalite*, which is the stable phase up to the melting point.

In molten silica, the silica molecules are randomly arranged; if the molten silica be cooled very quickly, there may not be sufficient time for the molecules to become part of a regular pattern by the time solidification is complete. Solidified silica in which the molecules are randomly arranged is known as *silica-glass* or *lechatelierite*.

Low-quartz is the stable phase at low temperatures, even under the highest pressures. However, between 380°C. and 585°C., at pressures greater than three hundred and forty atmospheres*, *keatite* is the most stable form of silica. At still higher temperatures, and pressures greater than twenty thousand atmospheres, *coesite* is the most stable phase. With temperatures of between 1200° and 1400°C., and pressures of more than one hundred thousand atmospheres, *stishovite* is the most stable phase.

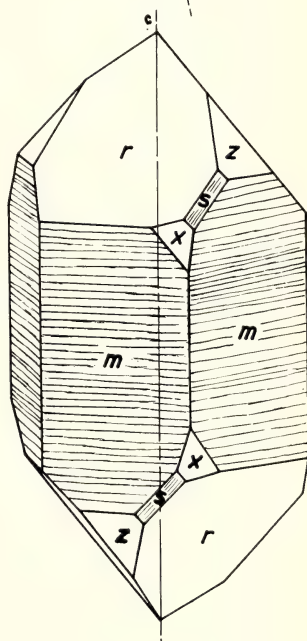
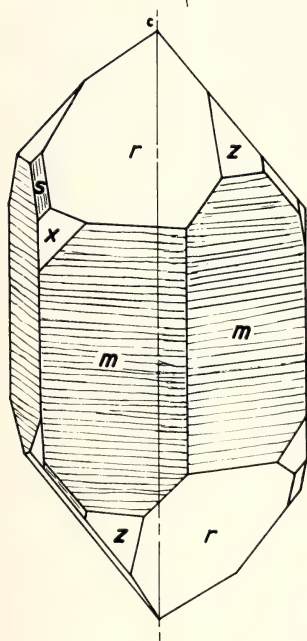
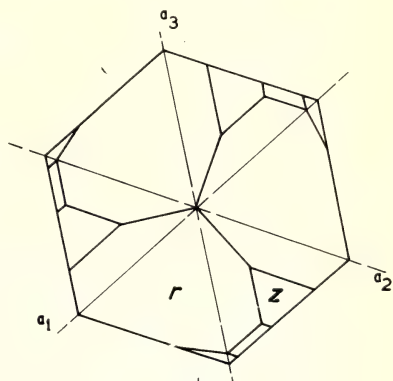
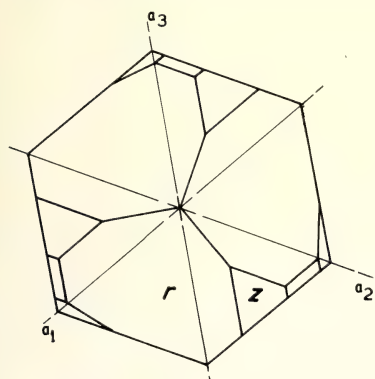
* The word "quartz" when used alone always refers to low-quartz.

† One atmosphere is approximately equal to a pressure of 14.66 pounds per square inch.

The various silica phases are quite distinct and the transformation (change) of one phase to another i.e., the rearrangement of the silica molecules, can occur only when certain critical temperatures and pressures have been reached.

All the silica minerals (with the

exception of the non-crystalline *lechatelierite* and *opaline silica*) are composed of tetrahedral (pyramid shaped) molecules in which each silicon atom is surrounded by four oxygen atoms. The way in which these molecules are combined varies with the different silica minerals.



Left-Handed

Right-Handed

QUARTZ

The best known form of silica is quartz. Even though quartz constitutes about twelve per cent of the Earth's crust, it is generally found as small grains in igneous, sedimentary or metamorphic rocks. Large masses of quartz are unusual, the largest crystal ever found (at Manchao Felipe in Brazil) being twenty feet long and weighing forty-four tons.

In quartz, the silicon and oxygen atoms form a tetrahedron in which each silicon atom is surrounded by four oxygen atoms. If we take a "tetrapak" of milk we may imagine the oxygen atoms to lie at the corners while the silicon atom lies inside the tetrapack. Each "tetrapak" is joined to its neighbors so as to form a spiral, the entire structure looking rather like a corkscrew or a spiral staircase.

Crystal Form:

Most quartz crystals consist of six prism faces, with three positive rhombohedron and three negative rhombohedron faces at each end of the crystal—a total of eighteen faces. The faces of the positive rhombohedron generally are larger and brighter than those of the negative rhombohedron. In addition, trigonal pyramid and positive trigonal trapezohedron faces are commonly present. These two forms slope upwards to the right on right-handed crystals and upwards to the left on left-handed crystals (fig. 1). Frondel (1) has listed four hundred and sixty-three crystal forms believed to occur on quartz crystals but most of these are very rare and extremely small.

As well as occurring in its own characteristic habits (shapes), quartz can replace many other objects, assuming their external form. About fifty different minerals (including calcite, gypsum and most of the rock-forming

minerals) are sometimes replaced by quartz. Wood, shells and bones are frequently replaced by fine-grained quartz and are then said to be *silicified*. Objects so replaced are said to be *pseudomorphed* by silica provided that the original form of the object has not been destroyed.

Twinning:

Nearly all quartz is twinned i.e., certain parts of a crystal are rotated relative to the remainder of the crystal. There are four main types of twinned crystals; Brazil twins, Dauphine twins, Combined Law twins and Japanese twins. The study of twinning is very difficult and requires a detailed knowledge of crystallography. The quartz plates used in wireless transmitters and other electronic equipment must be made from untwinned quartz.

Inclusions:

Quartz crystals frequently contain inclusions of liquids, gases and minerals; usually the inclusions are too small to be seen with the naked eye but sometimes the irregularly shaped cavities are fairly large (up to $2\frac{1}{4}$ " x $\frac{1}{4}$ "). Most inclusions consist of both a liquid and a gas. The contained fluid varies from nearly pure water to salt solutions of sodium, potassium and calcium chlorides and sulphates.

At room temperatures, liquid inclusions always contain some gas. One method of estimating the temperature of formation of the quartz involves determining the temperature at which the liquid just fills the cavity.

At least fifty-seven different minerals occur as inclusions in quartz. Of the minerals found as inclusions, *rutile*, *chlorite*, *tourmaline*, *clay minerals* and *iron oxides* are the most common. Rutile, of a reddish-yellow to yellow



Figure 2.

Needle-like inclusions of amphibole in a quartz crystal from California, U.S.A.

Photo: F. Bates

colour usually occurs as groups of divergent, needle-like crystals which may be as much as ten inches in length. Twinned, net-like (reticulated) aggregates of rutile in quartz are known as **sagenite**. Most rutilated quartz is either clear or smoky; amethyst may contain rutile inclusions, but, more commonly the inclusions in amethyst are of *goethite* (a hydrous iron oxide).

Tourmaline is often found as needle-like inclusions in quartz; if the inclusions are very small and numerous the quartz may appear to be black in colour.

In many Victorian gold-mining districts, green, opaque, moss-like inclusions, apparently of the mineral chlorite, are present within many of the quartz crystals.

Aventurine Quartz contains small flakes of *mica*. It may be white, silvery, reddish-brown or green in colour. Artificial aventurine is manufactured by dispersing flakes of copper in soft glass; it is known as "**goldstone**" and may be distinguished from the natural

material by its softness (a file will scratch "goldstone" but not natural aventurine).

Iron oxide particles frequently occur as inclusions in quartz crystals. Sometimes the iron oxide is more abundant on one side of the crystal than on the other; quartz crystals from Corunna Station, South Australia, are of this type.

Some quartz crystals have a transparent outer shell enclosing earlier formed crystals which are often outlined by zones of inclusions. If the outer shell is sufficiently transparent that the earlier formed crystals are visible then the quartz is said to contain "*phantoms*".

Varieties of Coarsely Crystalline Quartz:

Amethyst is a violet, bluish-violet or reddish-violet variety of quartz. The crystals usually are relatively small (up to five inches in length) and consist of positive rhombohedra; negative rhombohedra and prism faces may also

be present. The colour is caused by the presence of iron oxide (0.01% to 0.35% Fe_2O_3), the depth of colour varying with the iron content. When heated, amethyst loses its colour, the nature reached during the heating cycle. final shade depending on the temper-

Most amethyst occurs in cavities in rocks such as basalt; it occurs also in veins in granite and in some ore deposits. In Victoria, amethyst occurs near Beechworth as crystals and small pebbles.

Citrine is a transparent, yellow to yellowish-brown variety of quartz containing small amounts (less than 0.03% Fe_2O_3) of hydrous iron oxide. Citrine is much rarer than either amethyst or smoky quartz; as a result, most "citrine" gemstones consist of amethyst or smoky quartz that has been heated to 500-600°C.

Natural citrine usually is found associated with amethyst; the best known localities are in Brazil and Scotland.

Smoky quartz is very common; it may be nearly colourless (much so-called "colourless quartz" is slightly smoky), any shade of brown or even nearly black. Few specimens are evenly coloured throughout. Chemically, smoky quartz is similar to clear quartz. Frondel (1) states that much of the smoky quartz from the Swiss Alps contains about half the amount of impurities present in clear, colourless quartz from the same locality. It is thought that the smoky colour is due to the replacement of silicon atoms by aluminium atoms. This leads to an electrical imbalance which is the cause of the smoky colour.

Smoky quartz typically forms at relatively high temperatures, occurring

in many granites and granite pegmatites, occasionally as crystals weighing more than a thousand pounds. In Victoria, pebbles of smoky quartz are common in the Beechworth district. Smoky quartz occurs also as large grains in granite at Powelltown and Mount Buffalo.

Rose quartz is transparent to translucent, the colour varying from a pale rose-pink to fairly deep rose-red. Generally it occurs as flawed masses, but crystals have been found (in Brazil). Both crystals and the massive material occur in the central zones of some granite pegmatites. Occasionally, rutile inclusions cause *asterism*, the material appearing to contain a six-rayed "star". Manganese, and possibly titanium, are thought to cause the pink colour of rose quartz. Frequently opaque, pink vein quartz is found, the colour being caused by inclusions of clay minerals and finely divided iron oxides.

Blue quartz varies from pale, soft blue, to lavender in colour as a result of the scattering of light by millions of minute rutile crystals (as many as thirty-three million in one cubic inch of blue quartz). Blue quartz is common as a waste material in the mines at Broken Hill in New South Wales. It is formed in certain igneous and metamorphic rocks.

Milky (Reef or Vein) **quartz** is white in colour because light is scattered by flaws and cracks inside the material. In some cases, clay minerals enclosed within the quartz may cause it to have a porcellaneous appearance.

Rock crystal is the name given to clear, colourless quartz crystals. Despite its pure appearance small amounts of such elements as aluminium, sodium and titanium are often present. Small,



Figure 3.

Quartz Crystal (variety Rock Crystal) in a matrix of milky quartz, from Lyndhurst, South Australia.

Photo: F. Bates

doubly terminated crystals are sometimes called "diamonds" e.g., "Herkimer Diamonds" from Herkimer Country, New York, U.S.A.

Probably the largest known crystal of clear quartz was one weighing five and a half tons, found in Brazil. In Victoria, rock crystal has been found at Tallangatta and near Tallandoon, as well as at Woods Point and Gaffney's Creek. Large crystals of clear quartz have been mined from many localities in the New England district of New South Wales, especially near Hillgrove.

Varieties of Fine-Grained Quartz:

The fine-grained varieties of quartz are very common and some of them are often used as gemstones.

Chalcedony is a translucent, fibrous form of quartz, occurring as veins and cavities in other rocks, or as grape-like masses of a grey or pastel colour. Except for the sub-variety *agate* which has bands of different colours, chalcedony usually is uniformly coloured in any one specimen. In chalcedony the fibres lie at right angles to the surface; usually they can be seen only with the aid of a microscope and may form either parallel or fan-like aggregates.

There are many sub-varieties of chalcedony including:

Iris agate (Rainbow Agate) — white light falling on this type of chalcedony is split up into its component colours as a result of diffraction caused by the fibres.

Sard—a pale to dark-brown chalcedony which grades into:

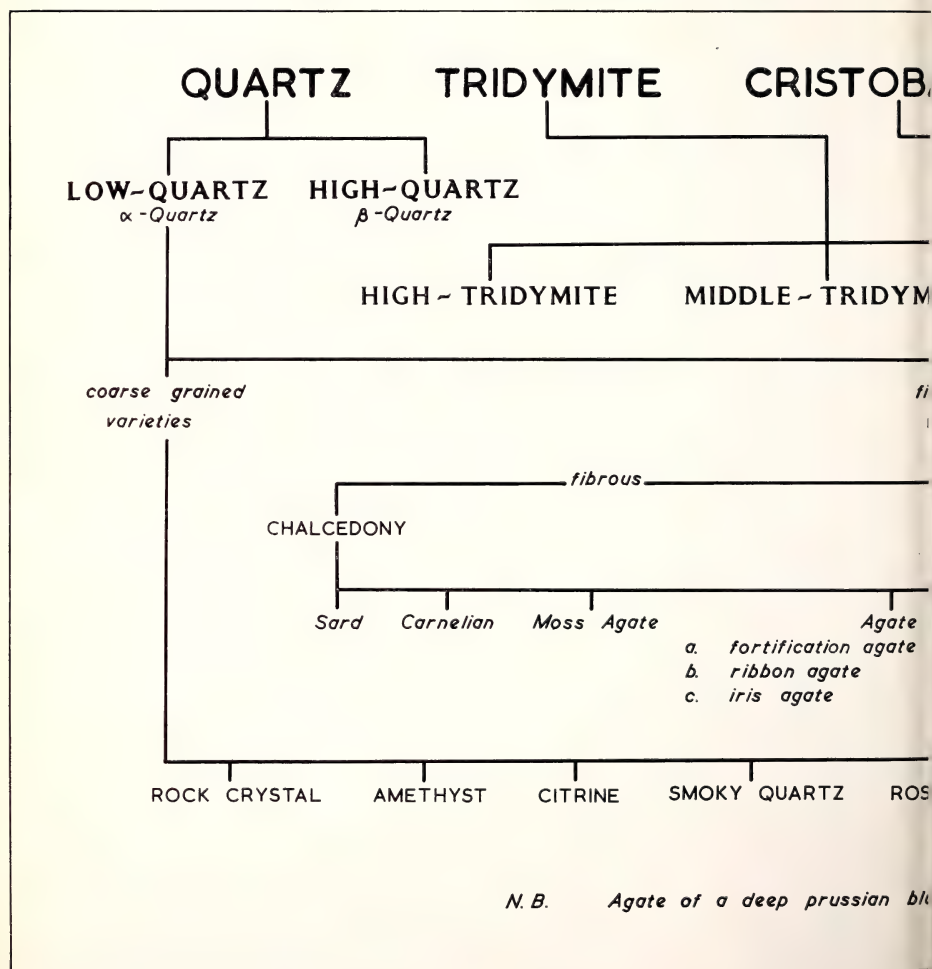
Carnelian—a translucent, reddish-brown to deep blood-red chalcedony, the colour of which is caused by the presence of finely divided iron oxides.

Moss agate—a translucent chalcedony containing black, dendritic (fern-like) inclusions of either iron or manganese oxides. The dendrites form by

the segregation of the iron and manganese when gelatinous silica loses water as it transforms into chalcedony.

Moss opal—is a similar material except that the silica is in the form of common opal. Very beautiful specimens of moss opal occur near Norseman in Western Australia.

Agate—a sub-variety of chalcedony characterised by well developed, continuous bands of uniform thickness.



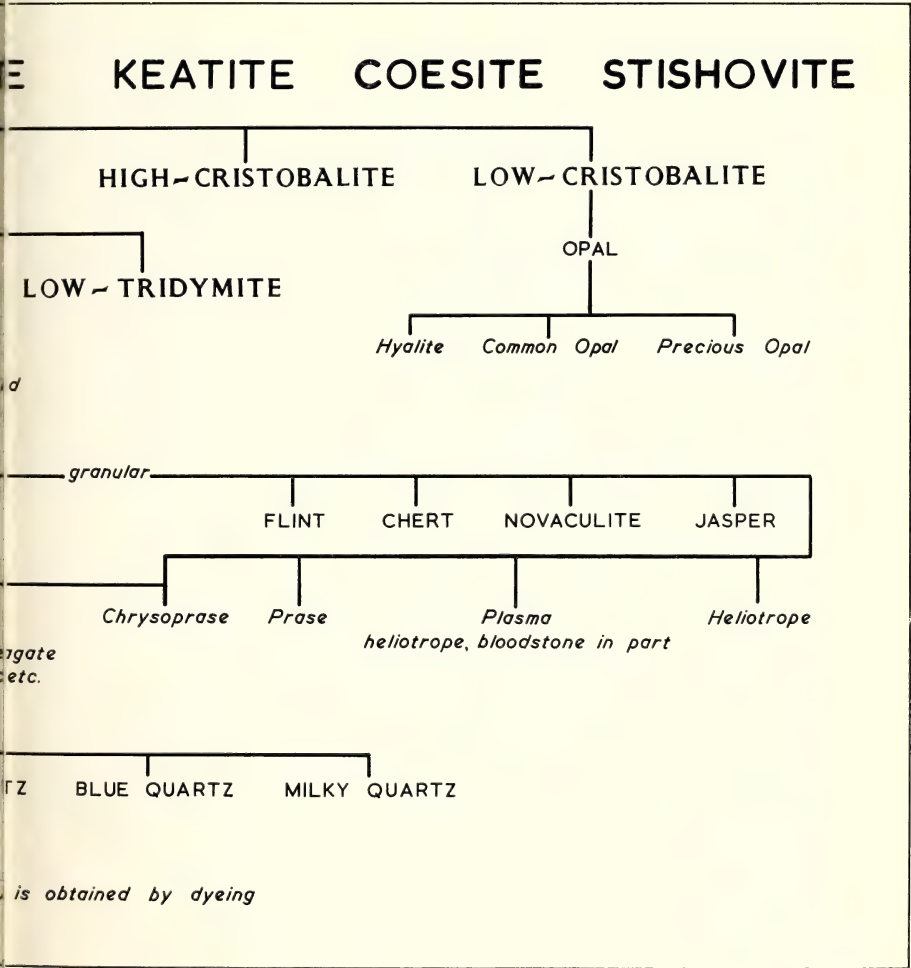
Agate is much used for jewellery, and hundreds of names have been given to the different combinations of colour pattern and banding.

Three major types of banding are recognized;

- a. Fortification Agate—the bands form sharp, re-entrant angles.
- b. Eye Agate—when sectioned, the bands are in the form of a series of concentric circles.

c. Ribbon Agate—the bands are straight and parallel.

Agate frequently occurs as “nodules” (irregular masses having an unattractive outer surface) in igneous flow rocks such as basalt. Generally, the nodules occupy cavities formed by the accumulation of gases as the lava forming the enclosing rock became solid. Usually, agate nodules are less than one foot in diameter but some-



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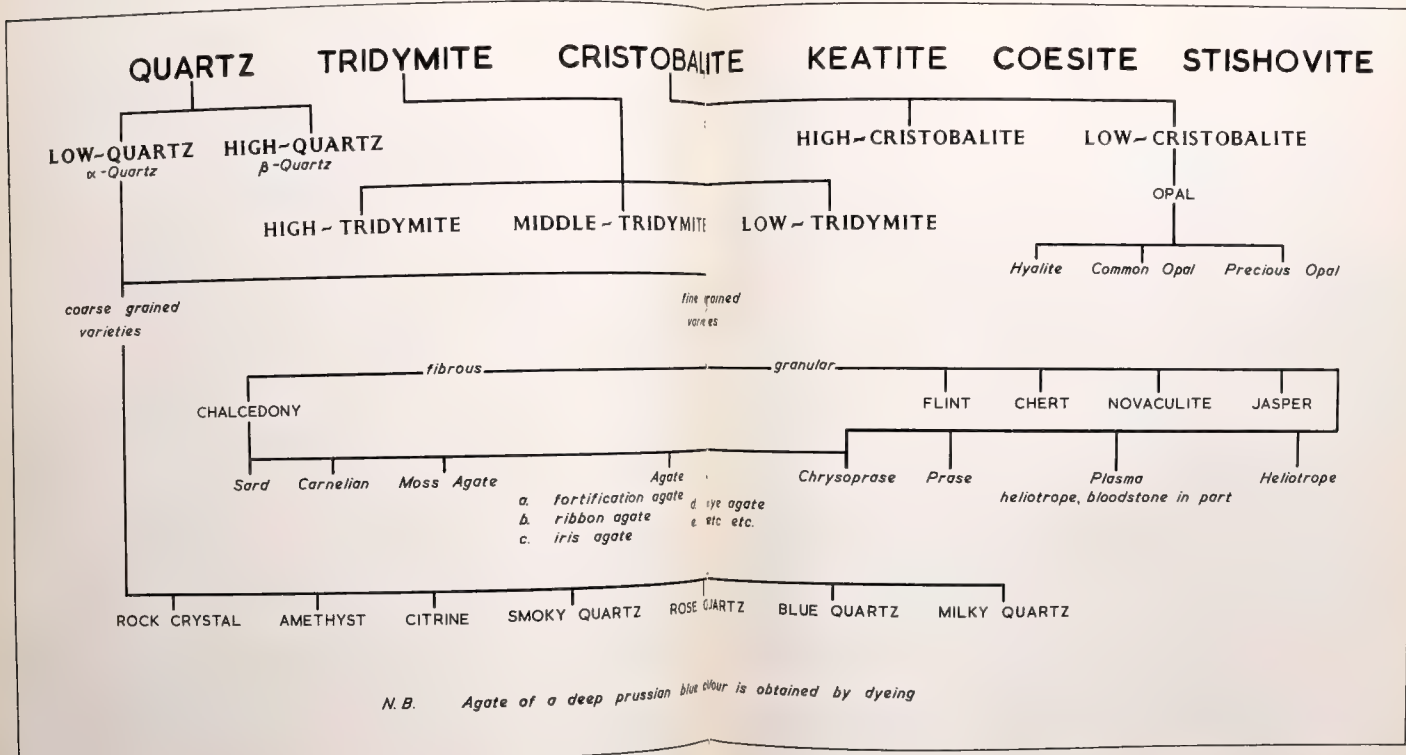
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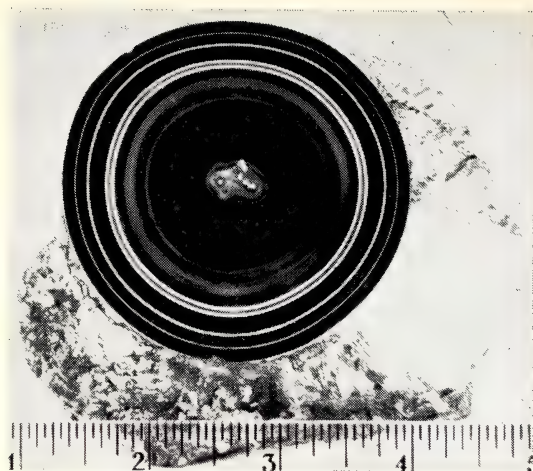
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FIGURE 4.





← 5a.

5b
↓
v

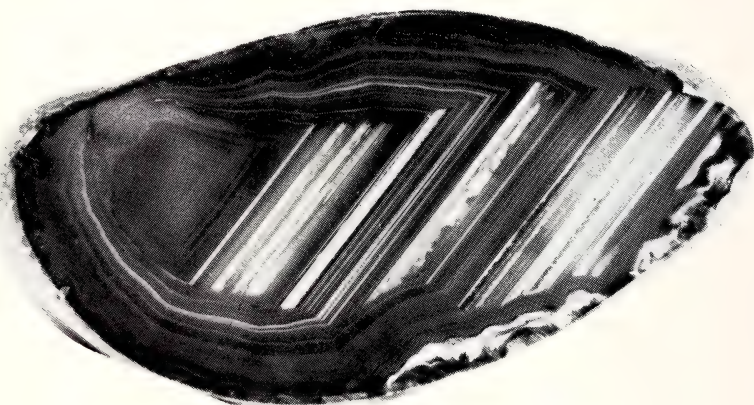


Figure 5.

Sectioned and polished agate nodules.

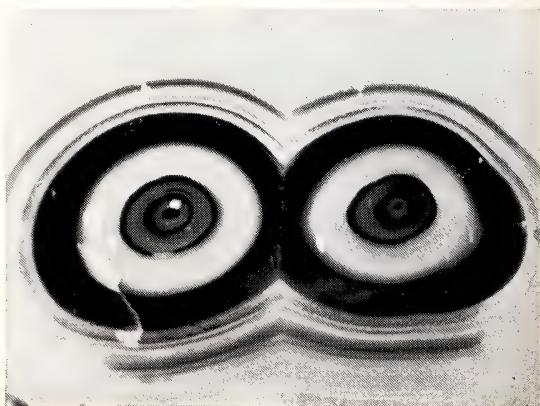
5a. Eye agate from Brazil, South America.

5b. Fortification and Ribbon agate, from Agate Creek, Queensland.

5c. Eye agate from Brazil, South Am-

Photos: Jeffrey Jamieson, National Museum of Victoria.

5c. →



times may be much larger. Commonly, the nodules have a central cavity filled with quartz crystals; such nodules are called *geodes*.

The best agate in Australia comes from Agate Creek in Queensland; small, beautifully coloured agate nodules have been found near Port Augusta in South Australia. Greyish-white agate pebbles occur in the Beechworth and Nowa Nowa districts in Victoria.

Chrysoprase—a translucent, apple-green, fibrous or granular variety of quartz containing small amounts of nickel silicate. It generally forms veins and cappings associated with weathered silica-poor igneous rocks. Chrysoprase occurs near Marlborough, Queensland*, near Kalgoorlie and at Wingellina in Western Australia.

Prase—a leek-green, translucent, granular variety of quartz, the colour being caused by the presence of inclusions of either *chlorite* or *amphibole* minerals.

Heliotrope and **Bloodstone** are opaque to somewhat translucent, granular varieties of quartz, of a green to greyish-green colour and containing small areas of red or yellow-brown jasper. Bloodstone occurs near Spargoville in Western Australia.

Flint and **Chert** differ from the other fine-grained forms of quartz in that they may be regarded both as sedimentary rocks and also as minerals. Both are granular, the grains being somewhat larger in chert. Fossils may be present and usually are silicified.

Geologists are still undecided about the way in which chert beds are formed. In some cases, the silica has

been dissolved during rock weathering and carried down to the sea (by rivers) where it is deposited on the sea floor, eventually forming chert beds. In other cases the chert beds appear to consist of silica released by volcanic activity and by the weathering of volcanic ash. This silica may either be deposited on the sea floor or may replace other rocks such as limestone.

Flint occurs as irregular nodules less than one foot in diameter and chalky-white in colour. Freshly broken (fracture) surfaces are smooth and curved (conchoidal), generally being dark grey or black in colour. The white outer coating consists either of silica or of calcium carbonate.

Chert is a form of quartz having somewhat curved and uneven fracture surfaces. Typically the colour is grey to whitish, yellowish or reddish. As the fracture surfaces become smoother, chert grades into flint.

Flint occurs as nodules in limestone (the flint nodules on Victorian beaches have weathered out of the Tertiary limestones near Portland in western Victoria) while chert generally forms large sheetlike, often bedded masses. Chert is found at Heathcote, Victoria and at Kiandra in southern New South Wales. It is common also in many parts of Queensland, the Northern Territory and Western Australia.

Novaculite—a white-coloured rock found in Arkansas, U.S.A., and composed of interlocking quartz grains. It is thought to be a chert that has been altered (metamorphosed) by heat and pressure.

Jasper is an opaque, fine-grained form of quartz containing up to twenty per cent of iron oxide. Generally it is red or yellow (due to the presence of finely divided hematite or limonite respectively), green or even black.

* "Australian Jade" is a name sometimes given to the chrysoprase from Marlborough. The name is undesirable since *jade* is an entirely different mineral.

Jasper is very closely related to chert but is distinguished by its even fracture and ability to take a high polish.

Jasper may occur in either sedimentary or metamorphic rocks; waterworn jasper pebbles are common in many Victorian rivers e.g., the Avon and the Stratford. Sedimentary rocks composed largely of jasper are common in parts of Western Australia.

Fine-grained forms of quartz very frequently are formed by deposition

from cold solutions containing small amounts of dissolved silica. Siliceous pseudomorphs are formed when silica-bearing solutions slowly dissolve the objects and at the same time replace the dissolved material with silica.

The coarse-grained forms of silica usually form from hot solutions associated with igneous rocks but some, notably vein quartz, may also be deposited by cool solutions or may represent resrystallized fine-grained silica.

HIGH QUARTZ

High-quartz occurs in igneous rocks that have solidified at temperatures above 573°C . e.g., *rhyolite* and *dacite*. Very often it has altered to low-quartz and is then generally opaque and of a white or greyish colour. High and low-quartz crystals are very similar in

appearance; however, high-quartz crystals are terminated by hexagonal pyramids and not by positive and negative rhombohedra. High-quartz may be either right or left handed, is usually twinned and breaks relatively easily in two directions.



Figure 6.

High (B)-Quartz crystals from Bougainville Island, T.P.N.G.

Photo: B. Smale

TRIDYMITES (HIGH-, MIDDLE-, LOW-)

High-tridymite is fairly common in silica-rich igneous rocks such as *rhyolite* and *dacite* where it occurs either as grains or small crystals a fraction of an inch in length, lining gas cavities. The crystals occur as flattened hexagonal prisms and pyramids, which, when twinned form rosettes called *trillings*; they are often opaque and of a light grey-brown colour.

High-tridymite forms only above 870°C. and alters (very slowly) to hexagonal middle-tridymite when cooled below 163°C. On further cooling to below 117°C., the middle-tridymite alters to orthorhombic low-tridymite. Consequently, all natural tridymite crystals consist of low-tridymite having the same shape as the original high-tridymite.

Low-tridymite is transparent and has a glassy lustre. All low-tridymite has formed by the slow cooling of high-tridymite.

HIGH CRISTOBALITE

High-cristobalite forms at very high temperatures (above 1470°C.) and on cooling, alters at 280°C. to low-cristobalite. High-cristobalite crystallises in the cubic system and whilst generally massive sometimes occurs as small, eight-sided (octahedral) crystals. Like tridymite it is about 2.2 times as dense as water (low-quartz is 2.67 times as dense as water). High-cristobalite occurs in silica-rich volcanic rocks that, geologically speaking, are relatively young.

Thunder Eggs are hollow, roughly spherical structures which have formed in silica-rich volcanic rocks such as rhyolites. They consist of radially arranged feldspar crystals surrounding steam cavities in the lava, the spaces between the crystals being occupied by high-cristobalite. This high-

cristobalite subsequently transformed to the low temperature form as the enclosing rock became cooler. The hollow interior either is partly or completely infilled agate, chalcedony and quartz. Occasionally, minerals such as calcite and hematite are also present.

LOW CRISTOBALITE

Low-cristobalite is tetragonal but almost always occurs as fibrous crusts and veins. It is the form of silica which is deposited by cool or warm water at ordinary pressures.

Opal is an amorphous or poorly crystalline variety of low-cristobalite containing up to twenty per cent by weight of water. The colour of opal varies greatly and may be caused by

1. the presence of impurities such as iron oxide.
2. scattering of light rays by small cracks within the opal.
3. *diffraction* of light rays by regular arrays of silica spheres. The study of the conditions necessary for diffraction to occur, requires a knowledge of advanced physics. A further difficulty is that the surfaces of both natural and cut opals normally are curved, not flat.

This last mechanism is responsible for the "play" of colours in precious opal; regular arrays of uniformly sized silica spheres cause white light to be *diffracted* or split up into its component colours.

For diffraction of visible light to occur, these spheres must be between 1700 and 3500Å* in diameter. The colour of an opal is proportional to the size of the spheres and is blue-violet when the spheres are approximately

* Å = Angstrom unit, a unit of length which equals one hundred-millionth of a centimetre i.e., there are approximately two hundred and fifty-four million angstrom units in one inch.

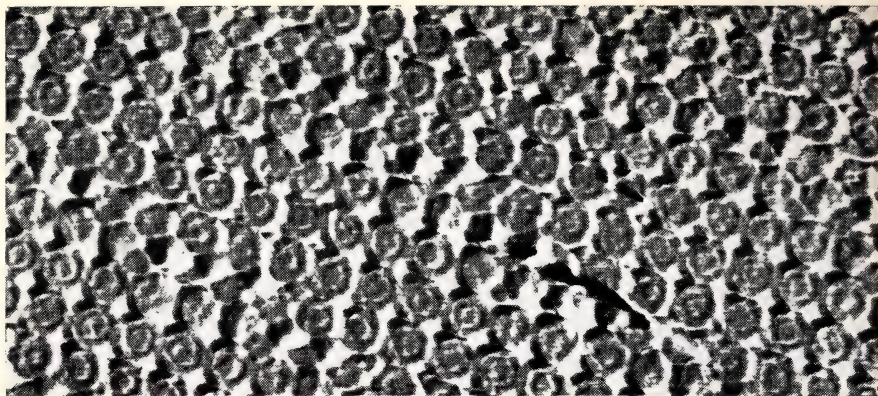


Figure 7.

Electron micrograph of Precious Opal section of fossil bone showing the regular shape and orderly array of the silica spheres. The spheres consist of secondary silica aggregates having a central core.

Photo: Dr. J. V. Sanders, Division of Tribophysics, CSIRO.

Magnification 25,000X

1750Å in diameter. Opal having both blue and green "fire" consists of spheres about 2000Å in diameter; spheres about 3500Å in diameter produce the full play of colours, including red.

Work carried out by the C.S.I.R.O. has indicated the conditions under which precious opal may be formed. In the arid parts of central Australia, precious opal occurs in seams and cavities in flat-lying sedimentary rocks.

Cavities in these rocks are filled with groundwater containing small amounts of dissolved silica, any water lost by evaporation being replaced by additional groundwater. As the amount of silica in the cavity increases, the water-rich silica molecules coalesce, forming small spheres. These spheres gradually sink to the bottom of the cavity where they cluster together as aggregates. If the jelly-like fluid at the bottom of the cavity is too viscous, either the aggregates will not be spherical or else they will not form regular arrays. In such a case precious opal will not form.

Initially the spherical silica aggregates are very soft and fragile. As the

cavity dries out (largely as a result of the sealing of the lower portions of the walls of the cavity by the jelly-like fluid), the aggregates lose water and become relatively hard. From time to time, more water may enter the cavity and, as it evaporates, the additional silica cements the aggregates together. During the drying process the aggregates may either be squeezed out of shape or the space between them may become completely filled with silica. In such a case, the play of colours would be less brilliant or may even completely disappear. When many of the spaces are irregular in form due to their being partly infilled by silica, the opal will have a milky appearance.

A layer of opal one centimeter (about 4/10") thick may require from two hundred thousand to five million years for its formation.

To summarise, the size of the silica aggregates determines the colours shown by a piece of opal and the form of the spaces between the aggregates controls the brilliance of these colours.

Common opal is formed under conditions that do not permit the accum-

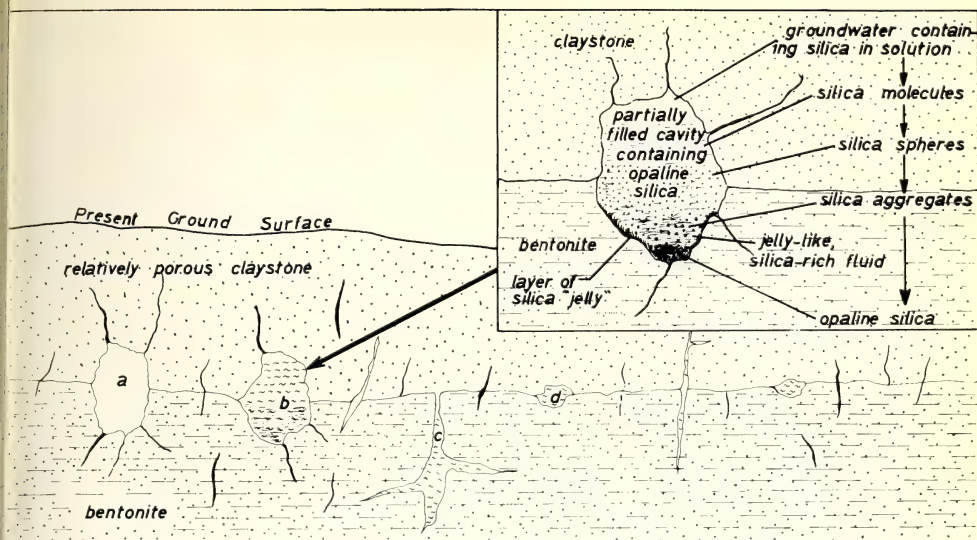


Figure 8: Diagram illustrating the formation of Precious Opal. (a) empty cavity, (b) partly filled cavity at the junction of a bentonite and an overlying claystone bed, (c) solution cavity, (d) opal replacement of fossil, (e) joint cavity INSET. Detailed view of a typical cavity showing water entering and leaving through fractures in the rock

ulation of regular arrays of spherical aggregates of a diameter sufficiently large to cause diffraction of visible light.

There are a number of sub-varieties of opal including;

Opalised Wood: Wood which has been replaced by opaline silica; the woody structure usually is clearly visible.

Opalised Bones and Opalised Shells are replacements of bones and shells respectively.

Moss Opal: Common opal containing inclusions of manganese or iron oxides. The inclusions often have a moss-like appearance.

Hyalite: A colourless, glassy form of common opal, usually occurring as globular masses or crusts.

Opal is a very common material; it occurs as cavity and fracture fillings in igneous and sedimentary rocks and also as a porous crusts or "sinter" near many hot springs. It forms the skeletons of many marine animals and plants and is the main constituent of the rocks known as *radiolarite* and *diatomite*. Wood, bones and shells are frequently found to have been replaced by either precious or common opal.

The world's main source of precious opal is the dry inland parts of Eastern Australia at such places as Lightning Ridge, Andamooka and Coober Pedy. Common opal is found in many places throughout Australia and fine specimens are common in the volcanic rocks north of Buchan, Victoria.

KEATITE

Keatite is a tetragonal form of silica not known to occur naturally.

COESITE

Coesite is a monoclinic form of silica formed by sudden, intense (shock) pressures. It is found at Meteor Crater, Arizona, U.S.A.

STISHOVITE

Stishovite is a tetragonal form of silica, 4.3 times as heavy as water, which is formed at very high temperatures and pressures. It is found as microscopic grains at Meteor Crater, Arizona.

LECHATIELIERITE

If molten silica is cooled very quickly there may not be time for it to become crystalline and silica glass or lechatelierite, will be formed. Generally it is formed when quartz grains are melted by either a meteorite impact or a lightning strike. Lightning strikes frequently form long, thin,

tapering tubes having smooth inner walls; the outside is coated with adhering sand grains. Afflurite from Goroke, in Western Victoria is more than five feet in length. Lechatelierite may also be formed when plant material such as haystacks are burnt.

Acknowledgements

The author is grateful to Dr. A. W. Beasley of the National Museum of Victoria, and to Mr. J. E. Johnson for advice and assistance in the preparation of the manuscript. Thanks are due to Mr. J. K. Jamieson for providing photographs of sawn agate nodules, and to the Director of the National Museum of Victoria for permission to publish these photographs. The Division of Applied Mineralogy, CSIRO, kindly provided information and the electron micrograph of precious opal.

FURTHER READING

Many books and scientific papers have been written about the various silica minerals; most of these are available at the State Library in Swanston Street, Melbourne.

Fron del, Clifford, *Dana's System of Mineralogy*, 7th. Ed. Volume III, Silica Minerals. Wiley, New York, 1962.

Beasley, A. W., "Some Geological Curiosities". *The Australian Lapidary Magazine*, Vol. 5 No. 11, pp. 7-9 June, 1969.

Darragh, P. J., Gaskin, A. J. Terrell, B. C. & Sanders, J. V., "Origin of Precious Opal". *Nature*, Vol. 209, No. 5018, pp. 13-16, January 1, 1965.

Darragh, P. J., and Gaskin, A. V.; "The Nature and Origin of Opal". *The Australian Gemmologist*, No. 66, pp. 5-9, December, 1966.

Darragh, P. J. and Sanders, J. V., "The Origin of Colour in Opal". *Australian Gemmologist*, 1965.

Bryan, W. H., "The Origin and Nature of Thunder Eggs". *The Australian Gemmologist*, pp. 5-9, June, 1964.

CORRECTION AND APOLOGY

In the *Vict. Nat.* **87**, (3) p. 79 for last month, it was wrongly reported that the Conservation Council of Victoria had called a meeting to consider the turning of Gemmills Swamp into an aquatic sports arena. In fact, it was the Shire of Rodney who called the meeting; and our apologies go to the CCV. [Ed.]

book reviews

The Last of Lands

Edited by L. J. Webb, D. Whitelock and J. Le Gay Brereton.

Jacaranda Press Pty. Ltd., 1969

204 + xvi pp., illustrated by 22 coloured, 82 black and white photographs. 10½" x 8". Price \$6.95.

This book arose out of a summer school on national parks and conservation held at the University of New England, Armidale, in 1964, and embodies contributions by an impressive group of collaborating authors covering all aspects of the vital subject of conservation in Australia. The introduction rightly claims that conservation ranks with nuclear war and multi-racial strife as the central challenge of our time. Outdated should be "the short-sighted greed (usually euphemized as 'development') and the old maxim: "If it moves, shoot it; if it stands still, cut it down".

There is a foreword by H.R.H. Prince Philip, Duke of Edinburgh, and the book is dedicated to the late Professor Jock Marshall, whose book, *The Great Extermination*, made as great an impact on the Australian scene as the late Rachel Carson's *Silent Spring* caused around the world.

Part I deals with conservation in general, the ecological aspects being dealt with by Dr. M. F. Day, of CSIRO, Canberra, former chairman of the Australian Academy of Science's Committee on National Parks and Reserves; conservation in relation to the land and its use by R. G. Downes, chairman of the Soil Conservation Authority of Victoria, and member of the National Parks Authority; the economic bases for decision-making on conservation by Dr. J. A. Sinden (University of New England) and Dr. W. F. Musgrave (senior lecturer in agricultural economics at the same university); recreational aspects by

R. D. Piesse, Director of the Australian Conservation Foundation; management problems of national parks by Dr. J. D. Ovington, head of Department of Forestry, ANU, Canberra, and an expert on international conservation; the role of public opinion in conservation, appropriately by Judith Wright (Mrs. McKinney), writer and poet, president of Wildlife Preservation Society of Queensland and former editor of its journal, *Wildlife in Australia*, and very active recently in demanding action to save the Great Barrier Reef; and, finally, international perspectives in nature conservation by Dr. William C. Robison, an American geographer interested in national parks and familiar with Australia after several long visits.

Part II consists of a setting-out of just *what* we have that deserves and urgently needs conservation. Australian ecosystems and their origins are discussed by Dr. J. Le Gay Brereton (Associate Professor of Zoology, University of New England), Dr. B. N. Richards (Dept. of Botany in that university) and J. B. Williams, ecologist of subtropical rainforests, montane beech forests and the kind of coastal sand-deposit rainforests at present threatened at Cooloola. The Australian flora is dealt with by J. G. Tracey (CSIRO ecologist, Brisbane), Dr. L. J. Webb (ditto), and Dr. W. T. Williams, 'the computer botanist', formerly of the University of Southampton but since of Canberra and Brisbane, a member of the Fauna and Flora Committee of the Australian Academy of Science. Re-

ference is made to Australia's many primitive plants and 'living fossils', and to the unique 'accessibility' here of such a wide variety of plant species, the dominance of evergreens and the absence of succulents. L. J. Webb deals with chemical research on Australian plants. The vertebrate fauna is treated by J. H. Calaby, CSIRO taxonomic mammalogist who has published much about our kangaroos, and Dr. Elizabeth N. Marks (University of Queensland entomologist, a leading expert on mosquitoes in the tropics) deals with the invertebrates. Dr. Donald F. McMichael, first Director of the Australian Conservation Foundation and now Director of National Parks and Wildlife in New South Wales, takes as his subject marine national parks.

Part III consists of a description and assessment of the status quo in each State with regard to national parks and conservation reserves, together with a discussion of current management problems, administration and legislation, and a look into the future towards the achievement of at least a 5 per cent figure of the total land area to be set aside in perpetuity and unassailability. Derek Whitelock, Adult Education Department, University of Adelaide (who organized the conservation seminar when doing similar work at New England), describes New England National Park, Gibraltar Range National Park (near Grafton, shockingly ravaged by a fierce bushfire in 1964, but in charge of a typically dedicated ranger) and Dorrigo National Park.

New South Wales in general is dealt with by staunch conservationist Allen Axel Strom, Queensland by J. K. Jarrett, secretary of the National Parks Association of Queensland, and Tasmania by Dr. J. G. Mosley, assistant director of the Australian Conservation Foundation. Our own

F.N.C.V. council member and leading conservationist, J. Ros Garnet, who has played a leading part for so many years in almost every society working for these aims (such as V.N.P.A., S.G.A.P. and N.P.P.S.), contributes an excellent chapter on the national parks and nature conservation areas of Victoria, telling the story from the sad rape of Tower Hill through the almost inadvertent reservation of areas that were considered useless for grazing and the successes of naturalists' agitation from time to time, down to the present era, with some items on the credit side but considerable debits too. Recommendations for a more representative National Parks Authority and the lessening of political interference are made.

South Australia's position is reviewed by C. Warren Bonython, President of the Nature Conservation Society of S.A., Western Australia by Vincent Serventy, present editor of *Wildlife in Australia*, author of natural history books and widely known for his 'Nature Walkabout' television films, and Northern Territory by Colonel Lionel Rose, chairman of the N.T. Reserves Board and author of the booklet on Ayers Rock—Mt. Olga National Park.

This is a long review, but its length is justified by the supreme importance of the theme of the book, which it is hoped will have a wide sale because all royalties will be donated to the Australian Conservation Foundation. The rate at which destruction is still being carried on, especially in Queensland and Western Australia, is heartbreaking, and the more publicity there is of this type and of the two lavishly illustrated 'coffee table' books on national parks recently published the more likelihood there is of a better climate of opinion on the urgent necessity of conservation.

J. A. Baines.

Australian Seashores in Colour

by Keith Gillet and John Yaldwyn.

A. H. & A. W. Reed, 1969.

Pp. 112, 52 col. p11. and numerous b.&w. figs. \$3.95.

This is one of the best of these publishers' series of small natural history books. The text provides detailed information on both general Australian marine biogeography and life histories of Australian marine animals, and the plates attain a superbness not usually found in works of natural history for the general reader at this price.

The opening chapters include maps showing the warm and cool currents affecting Australia and the distribution of the continental shelf. They also give a good introduction to understanding and observation of the varying waters and shores. The clear and

well labelled diagrammatic drawing of a representative animal for each of several groups exemplifies the authors' aim to instruct as well as captivate.

Unfortunately the Phyla are not clearly set out. There is a marked unevenness of treatment of animal groups, and to illustrate minor shortcomings, penguins would be more properly grouped with oceanic than with shore birds.

Nevertheless this book has the value of being a reference work as well as one which stimulates interest in a striking fashion pictorially.

A. R. McE.

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FIELD NATURALISTS CLUB OF VICTORIA

General Meeting 11 March

The meeting was attended by approximately 80 members and friends, and chaired by the Vice-President, Mr. T. Sault, in the absence of the President, Mr. E. Allan, now on an overseas trip.

It was moved by Mr. J. Swaby, seconded by Mr. Bishop that the Minutes of the General Meeting held on 9 February, 1970 be taken as read. A motion was moved by Mr. Woollard and seconded by Mr. A. Fairhall that the Minutes of the Annual General Meeting held 12 March, 1969, be taken as read.

Mr. T. Sault extended wishes on behalf of the Club for a speedy recovery to Mr. Hooke, Mr. Hanks and Mr. F. Zirkler who are on the sick list.

New members whose names appear in the March, 1970 Vic. Naturalist, were elected on the motion of Messrs. Cooper and Morrison.

The Treasurer's Report was presented by Mr. D. McInnes, who moved that the Balance Sheet and Statements as published in the *Victorian Naturalist* be adopted. This was seconded by Mr. J. Willis and carried with the approval of the meeting. Mr. McInnes commented on the deficit shown and said that this was due mainly to loss of membership and consequent loss of subscriptions, also to loss of advertising revenue. The continued excellent work done by Mrs. Strong as Sales Officer was commended by Mr. McInnes.

The Treasurer moved that the present Auditors, Danby Bland & Co., be appointed for the coming year. Seconded by Mr. Douglas.

Mr. T. Sault observed that considering the flood of books dealing with natural history on the market today, and the wide and increasing interest in the subject it would seem that membership should be growing.

The F.N.C.V. Office-Bearers for 1970-1971 are:—

President: Mr. T. Sault

Vice-Presidents: Mr. J. Strong, Mr. P. Curliss

Secretary: Mr. D. Lee

Asst. Secretary: Mr. R. Condron

Treasurer: Mr. D. McInnes

Asst. Treasurer: Messrs. E. King

Editor: Mr. G. Ward

Asst. Editor: Mr. P. Gahan

Librarian: Mr. P. Kelly

Asst. Librarian: Miss M. Lester

Excursion Secretary: Miss M. Allender

Residual Councillors: Mr. A. Fairhall, Mr. A. Lewis, Miss M. Morgan, Mrs. P. Strong.

It was moved by Mr. A. J. Swaby, seconded by Miss M. Allender that the 90th Annual Report by the Secretary as published in the March, 1970 issue of the *Vict. Nat.* be adopted.

Mr. Swaby brought to the notice of the meeting three points from the Secretary's report for their further consideration.

These were:—

- (a) This was the 28th anniversary of the formation of study groups within the Club and more group activity should be undertaken.
- (b) In answer to the question "what can the concerned citizen do", there was a need for greater co-operation with country clubs as opposed to individual action.
- (c) The Little Desert issue is not dead. The necessity for continued vigilance and interest in political moves on this subject was paramount.

Mr. Swaby concluded by moving a vote of thanks to the officers and Council for the past year's efforts. Seconded by Mr. Strong.

Correspondence:

A form was received from the Natural History Medallion Secretary asking for a nomination for this year. Council has nominated Miss Jean Galbraith, and a request for the setting up of a sub-committee to complete a dossier was put forward.

Support for the Bannockburn Wildflower Reserve as requested by the S.G.A.P. has been approved.

The meeting was informed of the death of Mr. Charles Gardner in West Australia; Mr. Gardner was the recipient of last year's Medallion.

It was moved by Miss J. Woollard and seconded by Mr. P. Curliss that the correspondence be received.

Subject for the Evening:

Under the title of "Conservation '70", a panel of three members, Messrs. J. Ros Garnet*, R. Johnson and D. Lee, spoke on different aspects of conservation.

* The lecture of this speaker will be printed in full in the *Vict. Nat.* for May.

Mr. R. Johnson, President of the B.O.C. used the title "Conservation — who cares?" for his talk. He stated that Govt. Depts. were required to control large areas within economic terms and although staff were competent, natural history studies were not particularly encouraged. Text books were not made available out of public funds. Do people using National Parks and Reserves care? The heaps of rubbish, bottles, cans, left lying about, lighting of fires, and the vandalism by shooters all contributed to making the rangers' jobs difficult, leaving no time for other matters.

Fraser National Park was an example where two excellent men were doing good work but the pressure of people was becoming too much.

Politicians did little more than satisfy their electors to a minimal degree. This was demonstrated recently when only one political party took advantage of help and advice from natural history bodies when a much publicised conservation issue was raised.

Scientists were usually more concerned with research than the subject but a new course at New England University on conservation was a start for greater studies at this level.

The public image of natural history clubs was unfortunate in that members were regarded by many as "cranks", "bug-hunters", and "compulsive letter writers". A new approach to the public was called for to attract new members by spreading propaganda in the right quarters. This could be done at the Nature Show, and by getting people with commercial interests in towns and country areas conservation minded. As a result the attraction of tourists could be a boost for their areas.

Money was found for almost everything except reserves, so people had to be convinced of the benefits that would accrue from conservation, the need for an appreciation of the aesthetic values, and the need for the protection of what had been conserved.

The Little Desert issue was an example of what could be done. Members of Parliament were bombarded with the greatest spate of letters and petitions in the history of Victoria and this helped to delay the program. The climate of conservation is very favorable at present, due largely to interest raised by the Little Desert controversy, making prospects for future projects very good.

The third speaker, Mr. D. Lee stressed the need for more active participation by members in collecting data and correlating information on certain localities. A mine of information was contained in the *Vict. Nat.* magazines but it was unavailable in its present form and needed to be collated so it could be used as a reference for particular areas. A case in point was the flora of the Sandringham Heathlands, Brighton and Beaumaris districts. This encompassed 250 square miles and was comprehensively described in the *Vict. Nat.* in 1912 by Dr. Charles Sutton; but none of this area had been preserved. Surveys of areas should be made as information gained may contain answers as to why pollution occurs and other problems. He concluded by observing that the basis of Natural History was history and members should put "history" back in "natural history".

Questions were addressed to the speakers on the litter problem. Mr. Cooper spoke of the issuing of 10,000 plastic litter bags to visitors over a holiday period at Wilson's Promontory. This had been very successful as only 5% were discarded.

Mr. Douglas commented on the great interest in natural history by the public because of the many letters he received in the course of his work as a journalist. He also made reference to the work done by the Mammal Survey Group, who were very active, and the possibility of being able to provide data on the Maribyrnong River Catchment Area, required by the Board of Works.

Miss J. Woollard suggested more use could be made of radio talk-back programs as an avenue for propaganda.

Mr. T. Sault said that greater interest should be taken in preserving geological features, many being unique to Victoria. It was desirable that members should become more active and older members give a lead to the younger ones with increased support to junior clubs.

Mr. Sault thanked the speakers and was enthusiastically supported by the audience.

Mr. J. Willis spoke on a project undertaken by Camberwell Boys Grammar School pupils during their summer camp at Mt. Disappointment regarding the study of lichen growth and also suggested that another area for research was the growth of porcupine grass.

Announcements:

Mr. and Mrs. J. Strong would be absent for three months during the winter and Miss Mary Morgan offered her services as Book Sales Officer for this period.

Mrs. G. Taylor advised that the quarterly meeting of the V.N.P.A. would be held on 23rd March and the speaker to be Prof. Turner whose subject was "Conservation in Great Britain".

The Save Our Bushland Action Committee would hold a film night with an address by Dr. Malcolm Hall on 29th April. The venue was the Assembly Hall, Methodist Ladies College, Fitzwilliam Street, Kew.

Mr. Douglas announced that a society had been formed for the preservation of an area of 8,000 acres at Mt. Macedon and that plans were in hand to begin work on this proposal.

Exhibits:

A map of the Little Desert and Wyperfeld National Park areas was tabled by Mr. D. McInnes.

Mr. T. Sault showed fan weed, a green algae, under the Microscope.

Mr. A. J. Swaby showed a mat plant, *Sagina procumbens* grown in a pot and a seedling of *Homolanthus populifolius*, the Queensland poplar.

Miss Allender gave details of the Easter excursion to Warrnambool and districts and said that the Warrnambool Club would be leaders. There were still some vacancies.

Mr. D. McInnes advised that there were some vacancies available on the camp-out being organised by the Hawthorn Juniors at Easter to Wyperfeld National Park and the Little Desert. The provision of camp gear and food was necessary.

Botany Group Meeting

12 February

There was a good attendance of 28 members and visitors, with Mr. Fairhall in the Chair. After dealing with various business matters, such as the Botany Group exhibit at the Nature Show (an historical subject, the "New Plants" and the botanists of Captain Cook's Expedition), and a program of day and week-end excursions for the year, the subject for the evening was introduced—"The Identification of W.A. Wildflowers". Mr. Fell, who has been living in W.A. for some time, showed slides of beautiful specimens and was able to help with many of the names. He also spoke

about and showed slides of the indiscriminate burning and bull-dozing which is occurring in the South-West of W.A. He showed pictures of superb natural gardens near Cape d'Entrecasteaux which were later quite destroyed by burning-off. There were also pictures of the same thing in the beautiful approaches to the Stirling Ranges, due to so-called "protective burning".

Mr. Alan Morrison showed and named clearly many lovely and uncommon flowers, one being the rarely-noticed Lazy Orchid (*Caladenia multiclaira*). Miss M. Elder, Miss E. Jones and Miss M. Allender also showed interesting and helpful slides.

Geology Group Meeting

4 February

Twenty two members and visitors attended. The newly elected Chairman for 1970, Mr. Blackburn, occupied the Chair. The Subject for the evening was of Holiday Reminiscences. Members showed slides and exhibited specimens collected during the holiday recess. Mr. B. Cooper spoke about slides taken on a previous excursion to S.A. These included views of the Pre-Cambrian rocks there, (Adelaide Basement Series), and also Pre-Cambrian Tillite and Permian Tillite. Others included folded Jasperlite (low grade iron-ore) at Iron-Duke. Messrs McInnes and Sault spoke of rocks collected on the Bogong High Plains and exhibited specimens and microscopic slides of some of these. Also exhibited from this area were fossilized leaves and plant remains in shale underlying a thin seam of coal under Tertiary Basalt at Bundarra River. Mr. Dodds spoke of Glacial Pavements at the newly built Commadai reservoir. Many of these have now been inundated by the rising waters. He reminded members that anyone wishing to collect fossil Ostracods should do so before the winter rains as the bed containing the fossils may be permanently covered with water.

Other exhibits:—

Miss *Pertinac*—Tourmaline and Garnet, Wodonga.

Mr. *Holmes*—Fossil shells, (Permian) collected during the Hawthorn Juniors Christmas excursion to Tasmania.

Mr. *Taylor*—Gabbro, Waratah Bay. Chalcedony, Laverton, W.A. Selwynite, Heathcote. Volcanic bombs, Mt. Pordoon.

Mr. *Dodds*—Muscovite, India. Silver-Lead-Zinc Ore, Parnell Mine, Broken-Hill. Opal, Gelantipy.

F.N.C.V. DIARY OF COMING EVENTS

GENERAL MEETINGS

Wednesday, 13 April—General Meeting at National Herbarium, The Domain, South Yarra, commencing at 8 p.m.

1. Minutes, Reports, Announcements.
2. Correspondence.
3. Subject for the evening—"From Gibbers to Greenery" (Birdwatching across Northern N.S.W. and Southern Queensland). Illustrated with colour slides. Speaker: Miss Helen Aston.
4. New members.

February and March, 1970

(a) *Ordinary:*

Miss Mary Carlisle, 117 Barkly St., North Fitzroy, 3068.
Miss Janey Jackson, 58 Cascade St., North Balwyn, 3104. (Mammals)
Mr. David Moore, 6 Kingsley St., Camberwell, 3124.
Miss Caroline Mountain, 56 Grosvenor St., Prahran, 3181 (Botany)
Miss Jeannette S. Hales, Flat 2/12 Illawarra Rd., Hawthorn, 3122. (Fauna, Flora.)
Miss Catherine Kyne, 22 Lambert Rd., Toorak, 3142.

Joint Ordinary:

Noel Byass, with Mrs. R. Byass, 23 Kingston Rd., Surrey Hills, 3127.
Mrs. J. Gilmour, with Mrs. L. Greenwood, 343 Toorak Rd., Burwood, 3125.
(Ornithology, Botany)

(b) *Country:*

Mrs. D. M. Rasche, Private Bag 10, Ultima, Vict., 3544.
Mrs. Helen Begg, "Arran," Portsea, Vict., 3944.

(c) *Junior:*

Harold E. Parnaby, 35 Campbell St., Castlemaine, Vict., 3450.
Francis Payne, Flat 299/332 Park St., South Melbourne, 3205.
Alan Burns, 11 Ivanhoe Gve., Chadstone, 3148.

5. General Business.
6. Nature Notes and Exhibits.

Monday, 11 May—Banksias and their Relations of the family Protaceae.
Speaker: F. J. Rogers.

F.N.C.V. EXCURSIONS

Sunday, 12 April—Botany Group excursion to Macedon area. Meet 10.55 a.m. at Macedon Station or contact Mr. K. Kleinecke (Phone 25-2415) regarding transport.

Sunday, 19 April—Werribee Gorge. Leaders Mr. J. Myers and Mr. D. McInnes. The coach leaves Batman Avenue at 9.30 a.m. fare \$1.60. Bring one meal and a snack.

GROUP MEETINGS

All members of the club are welcome at Group Meetings. 8 p.m. at National Herbarium unless otherwise stated.)

Thursday, 9 April—Botany Group. Miss M. Lester will speak on "Myrtaceae".

Wednesday, 15 April—Microscopical Group.

Friday, 24 April—Junior meeting at Hawthorn Town Hall at 8 p.m.

Monday, 4 May—Entomology and Marine Biology Group meeting at 8 p.m. at the National Museum in small room to theatre.

Wednesday, 6 May—Geology Group. Speaker—Mr. K. Hammond. Subject—Basin Evolution.

Thursday, 7 May—Mammal Survey, Group Meeting at Sir Arthur Rylah Institute, corner of Stradbroke Ave. & Brown St., Heidelberg, at 8 p.m.

Thursday, 14 May—Botany Group. Mr. J. Barnes will speak on The Botany of Captain Cook's Voyages.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.

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Hon. Librarian: Mr. P. KELLY, c/o National Herbarium. The Domain, South Yarra 3141.

Hon. Excursion Secretary: Miss M. ALLENDER, 19 Hawthorn Avenue, Caulfield 3161.

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Magazine Sales Officer: Mr. B. FUHRER, 25 Sunhill Av., North Ringwood, 3134.

Book Sales Officer: Mrs. J. STRONG.

Group Secretaries:

Botany: Mrs. R. WEBB-WARE, 29 The Righi, South Yarra (26 1079).

Microscopical: Mr. M. H. MEYER, 36 Milroy Street, East Brighton (96 3268).

Mammal Survey: Mr. P. HOMAN, 40 Howard Street, Reservoir 3073.

Entomology and Marine Biology: Mr. J. W. H. STRONG, Flat 11, "Palm Court", 1160 Dandenong Rd., Murrumbeena 3163 (56 2271).

Geology: Mr. N. WIGMORE, 56 Brett Street, Murrumbeena 3163 (56 1485).

MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available, and other activities are indicated in reports set out in the several preceding pages of this magazine.

Rates of Subscriptions for 1970

Ordinary Members	\$7.00
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Junior Members receiving Vict. Nat.	\$4.00
Subscribers to Vict. Nat.	\$5.00
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The cost of individual copies of the **Vict. Nat.** will be 45 cents.

All subscriptions should be made payable to the Field Naturalists Club of Victoria, and posted to the Subscription Secretary.



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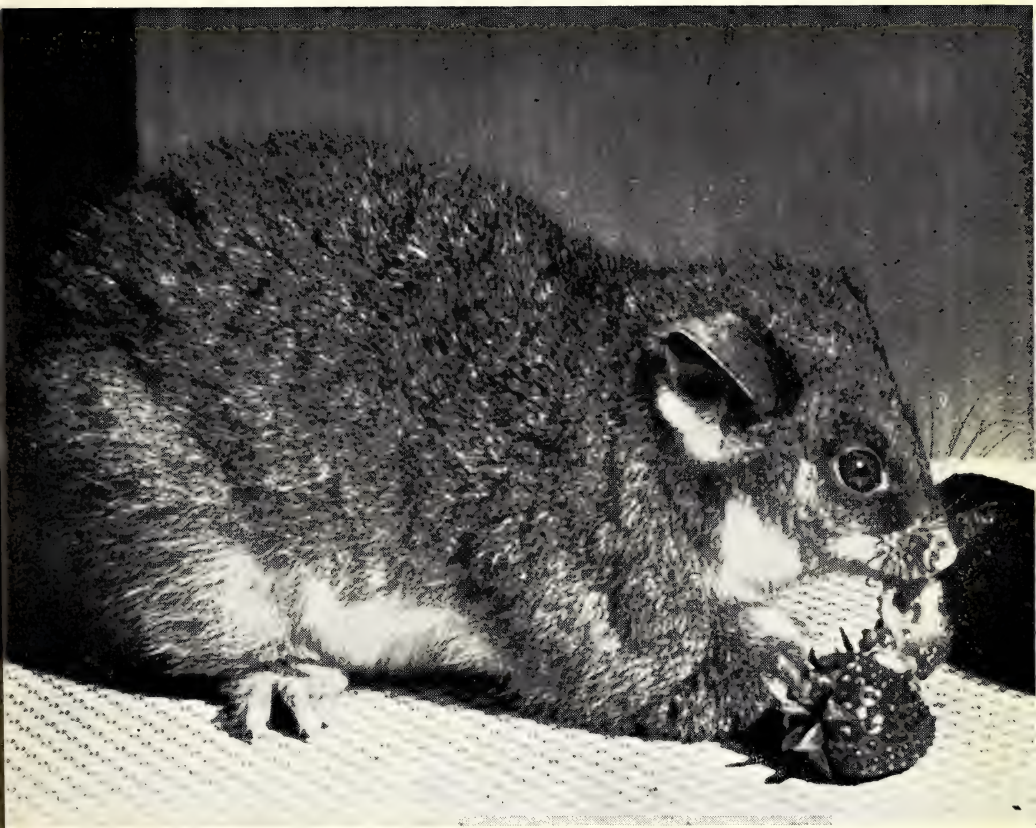
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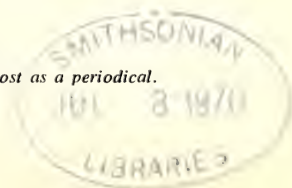
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F.N.C.V. DIARY OF COMING EVENTS

GENERAL MEETINGS

Monday, 11 May—At National Herbarium, The Domain, South Yarra, commencing at 8 p.m.

1. Minutes, Reports, Announcements.
2. Correspondence.
3. Subject for the evening—Banksias and their Relations of the family Protaceae: F. J. Rogers.
4. New Members.

Ordinary:

Mrs. Emma M. Adams, 5 Rochester Road, Canterbury, 3126.
Mr. John L. Baulch, Flat 6, 10 James Road, Croydon, 3136. (Interest—Mammals.)
Mr. David Pye, 24 Innellan Road, Murrumbidgee, 3165. (Interest—Botany and Zoology.)
Mr. F. J. C. Rogers, 108 Wantirna Road, Ringwood, 3134.
Mr. Gary J. Smith, Monash University Department of Zoology, Clayton, 3168.

5. General Business.
6. Nature Notes and Exhibits.

June—"The Tide will Turn": Mr. E. G. Wallis.

July—"A Biological Survey of Victoria": Mr. R. T. M. Prescott. Prescott.

Group Meetings

(8 p.m. at the National Herbarium unless otherwise stated)

Thursday, 14 May—Botany Group. "Orchids" by Mr. I. Morrison. The talk by Mr. J. Baines announced for this date in the last Naturalist will be given in June.

Wednesday, 20 May—Microscopical Group.

Friday, 29 May—Junior meeting at 8 p.m. at the Hawthorn Town Hall.

Monday, 1 June—Entomology and Marine Biology Group meeting at the National Museum at 8 p.m. in small room beside theatre.

Wednesday, 3 June—Geology Group.

Thursday, 4 June—Mammal Survey Group meeting at 8 p.m. in the Arthur Rylah Research Centre for Environmental Studies—corner of Brown Street, and Stradbroke Avenue, Heidelberg.

Friday, 5 June—Preston Junior F.N.C. meeting in Rechabite Hall, 281 High Street, Preston, at 8 p.m.

Thursday, 11 June—Botany. "The Botany of Captain Cook's Voyage". Speaker Mr. J. Baines.

F.N.C.V. Excursions

Sunday, 10 May—Botany Group excursion to the Old Black Spur Road. Meet at the Ringwood Station at 10.15 a.m. Bring one meal and a snack. Would anyone going who would be willing to take another member in the car please notify Mr. K. Kleinecke at 8 Oliver Street, Ashburton (phone 25-2415).

Sunday, 17 May—Tonimbuk area. The coach will leave Batman Avenue at 9.30 a.m. Fare: \$1.70. Bring two meals.

Geology Group Excursions

Sunday, 10 May—To Airey's Inlet. Leader: Mr. George Carlos.

Sunday, 7 June—Maribyrnong River Terraces. Leader: Mr. Dan McInnes. (Previously advertised for 10 May.)

Sunday, 5 July—To Cave Hill (Lilydale) Limestone Quarry. Leader: Mr. J. Dobson.

Sunday, 9 August—To Heathcote. Leader: Mr. R. Davidson.

Transport is by private car (spare seats are usually available for those without their own transport). Excursions leave from the western end of Flinders Street Station, opposite the C.T.A. Building, at 9.30 a.m.

Preliminary Notice

A camping trip to Wyperfeld and the Little Desert is proposed for the first week in September and the excursion secretary would like to hear from members interested in the proposal. A coach would be chartered but members would be responsible for their own meals and camping gear.

The Victorian Naturalist

Editor: G. M. Ward

Assistant Editor: P. Gahan



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7 May, 1970

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Front Cover:

The acceptance of a human relationship by some of our marsupials is evident from the photograph of a juvenile Ringtail Possum, which was fostered by members of the Goode family, after the death of its mother.

Photo: J. Goode.

Oil Glands in the Bark of Victorian Eucalypts

by

STELLA G. M. CARR* and D. J. CARR*

The use of the common name "scent bark" for *Eucalyptus aromaphloia* may give the impression that the species is unusual in having aromatic bark. Costermans (1966) mentions only one other species (*E. bridgesiana*, "Apple box" or "But-but") as having scented bark.

At the end of the present paper we list 28 of the eucalypt species of Victoria which show this character. The aromatic property is due to the presence of oil glands in the bark (in the Victorian species, in the secondary phloem) of both stems and roots. In the stems they occur in several different patterns, either scattered throughout the bark or more or less confined to the phloem rays, which may be considerably expanded in the outer bark (Plate 2, Fig. 2). In some Northern Australian and Western Australian species the glands occur chiefly in the layers of vertical parenchyma which alternate with the bands of fibres and sieve tubes in the phloem. In the roots they occur mostly in the phloem rays in the Victorian species (Plate 1, Figs. 2 & 3). The oil secreted by the bark glands has the same properties and qualitatively, but not quantitatively, the same composition as that in the leaves (Smith, 1916 for *E. macarthurii*; Baker and Smith, 1920 for *E. bridgesiana*; Lassak and Southwell, 1969, for *E. crenulata*).

The Victorian species with bark glands are those included in Macrantherae-Normales with the addition of

E. ovata and *E. ovata* var. *grandiflora* from Macrantherae. (Nomenclature in this paper follows that of Johnston and Marryat in Blakely, 3rd Edition, 1965.) That some eucalypts have oil glands in the bark has been known since 1875 when Moeller (1875, 1882) published the results of investigation of specimens of bark of "*E. viminalis*" and "*E. stuartiana*" sent to him by Mueller (1879-1884). The identity of the specimens sent is in some doubt, as pointed out by Welch (1922). Mueller (loc. cit.) was clearly dubious of Moeller's findings since he reports only "kino spaces" in the bark of "*E. viminalis*". Curiously, Mueller also reports of *E. globulus* that the "middle bark is without reservoirs of oils, resin and kino", but says nothing of the older bark. Solereder (1908) was also dubious about the correctness of Moeller's work—possibly influenced by Mueller's scepticism. Bark oil glands were re-investigated by Welch (1922) and by Chattaway (1953, 1955). We have recently reported a more complete investigation (Carr and Carr, 1969).

The eucalypts which have glands in the bark do not fall into a single bark category in the accepted sense. *E. viminalis*, *E. rubida* and *E. bicostata* are smooth-barked ("gums"). *E. goniocalyx* and *E. bridgesiana* have bark resembling that of the boxes. If the species concerned is "half-barked", i.e., with rough bark at the butt and smooth bark above, glands occur in both types of bark. It is important to note that the glands under

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discussion are in the phloem or phloem derivatives. All eucalypts have oil glands in the primary cortex of the young stem, but no eucalypts have them in the cortex of the root. After periderm formation, the primary cortex is eventually cut off and shed, to be replaced by tissues derived mainly from the phloem which form the mature bark (Plate 1). In the majority of eucalypts oil glands do *not* form in the bark. In those species which do have them, the time at which oil glands first appear in the bark is very variable. In some species (e.g. *E. cinerea* and *E. bridgesiana*) glands first appear in the bark of stems which are about three years old, but in species such as *E. globulus* they may not be formed until the stems are between ten and twenty years old. As a rule, oil glands develop in the root bark earlier than in the stem bark. We have found them in roots only 0.5 mm in diameter and their occurrence in such fine roots means that digging or other soil disturbance, involving damage to root systems, releases the essential oil. It is curious that there appear to be no reports of this in the literature.

The surest way to test for the presence or absence of oil glands in the bark is to cut thin sections and examine them with a microscope, but much can be learnt from simple field tests. From what has been said already it is evident that one should avoid, if possible, sampling very young bark. It is equally advisable to avoid very old, weathered bark at the base of the trunk, since, even if the remains of oil glands are present, they may have lost their aromatic oils and so escape detection by smell and also be difficult to identify with a lens. Take a small piece of bark from the trunk at about breast height; crumble it between finger and thumb and smell

it. If the bark will not crumble easily, rub two small pieces together. Either treatment will damage the glands (if present) and release the oil. It is advisable to use dry bark for these tests as the characteristic odour of the oil may be masked or less obvious with very wet bark. The glands, if present, can be seen by examining a cut surface of the bark with a hand lens (10x); the cut should be made parallel to the surface of the trunk. Alternatively, the *inside* of a flake of outer bark, similarly examined, may show the oil glands or pock marks where they have been (Plates 2 and 3). It is recommended that the presence of oil glands be tested for by both smell and examination with a hand lens since some species which lack oil glands have large stone cells which can be mistaken for oil glands as they are about the same size. However, in practice we have found that in most species the oil glands are readily recognised when present. In some smooth-barked species the presence of oil glands affects the surface modelling of the bark. Small hemispherical depressions and projections mark the sites previously occupied by glands.

We have examined all the Victorian species listed in Blakely with the exception of *E. maidenii* var. *williamsonii* (Mallacoota Gum) *E. para-doxxa* (Metung Blue Gum) and *E. viminalis* var. *rhynchocorys* (Snowy River). All these forms are placed in Macrantherae-Normales and although their validity as taxa is questionable it would be of interest to examine their barks. *E. studleyensis* which is presumed to be of hybrid origin (*E. camaldulensis* x *E. ovata*) has no glands in the stem bark which seems to suggest that it is closer to *E. camaldulensis* than to *E. ovata*. The red gums have no bark glands.

The only two anomalous Victorian species are *E. kitsoniana* and *E. neglecta*. In New South Wales, *E. quadrangulata* is also anomalous. These species have very many features in common with typical members of Macrantherae Normales but, as far as our investigations go, the Victorian species have no glands in either the stem or root bark, and the case of

E. quadrangulata is dubious. Further investigation in the field is necessary to find out whether the absence of glands is a constant feature of these species.

Acknowledgments

We would like to acknowledge our indebtedness to very many people, not least Miss P. Carolan, for field collections of bark.

Victorian species with bark glands

aggregata, aromaphloia
bicostata, bridgesiana
camphora, cephalocarpa, chapmaniana, cinerea, corticosa, crenulata, cypellocarpa
dalrympleana
glaucescens, globulus, goniocalyx
mannifera ssp. maculosa, maidenii
nitens, nortonii
ovata, ovata var. grandiflora
perriniana, pryoriana
rubida
smithii, st. johnii
viminalis
yarraensis

New South Wales species (other than any listed above) with bark glands

acaciaeformis, angophoroides
badjensis, baeuerlenii, banksii
corticosa
dunnii
macarthurii, malacoxylon, mannifera ssp. gullickii, mannifera ssp. praecox
nicholii, nova-anglica
parvifolia, pulverulenta
scoparia

Tasmanian species (other than any listed above) with bark glands

archeri
cordata
divaricata
gunnii
johnstonii
morrisbyi
rodwayi
subcrenulata
unialata, urnigera
vernica

Species of Macrantherae Normales, other than those listed above, with bark glands

antipolitensis
huberana (South Australia)
mortoniana

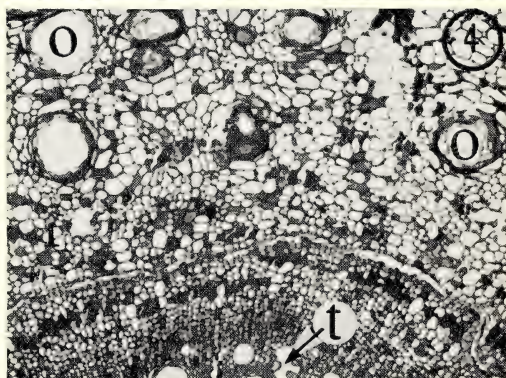
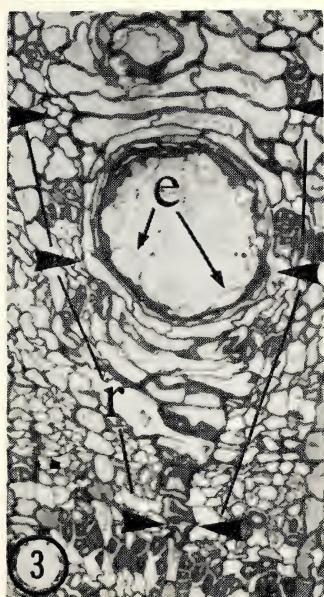
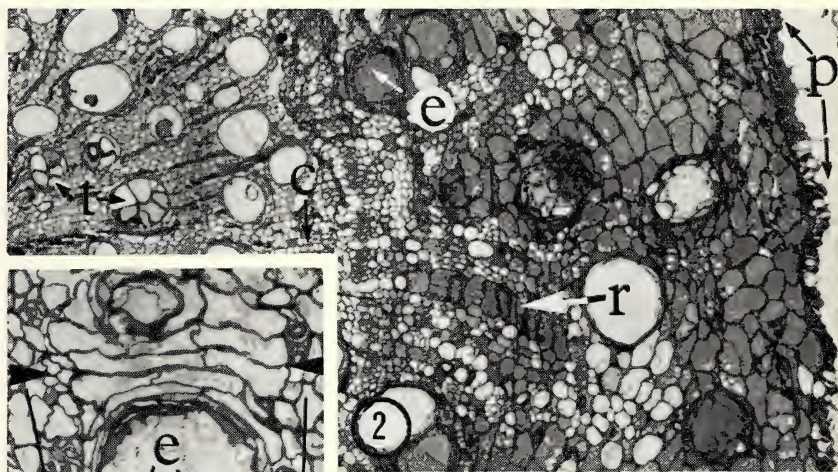
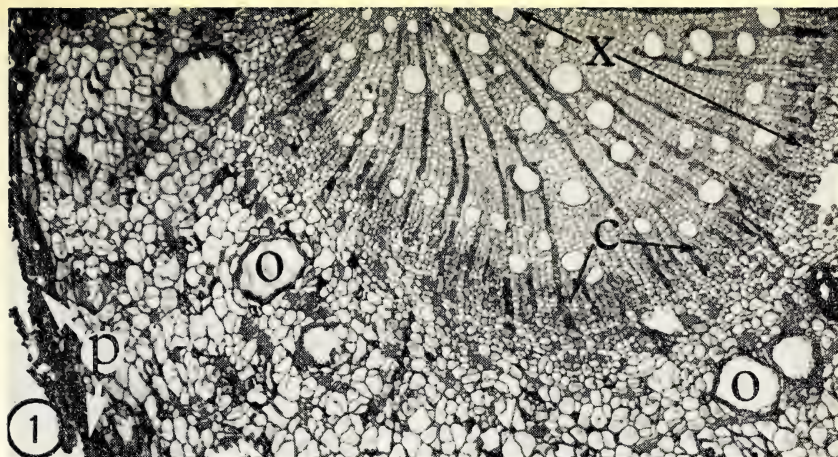


Plate 1. Transverse sections of the bark of roots.
 C = cambium; E = epithelial layer of gland; O = oil gland; P = periderm;
 R = ray; T = tyloses in xylem vessels; X = xylem.
 Figure 1. *E. cinerea* (x 56) (diameter of root = 3 mm.).
 Figure 2. *E. cephalocarpa* (x 65).
 Figure 3. *E. aggregata* (x 150), to show glands formed from parenchyma of an
 expanded ray. Figure 4. *E. dalrympleana* (x 65).

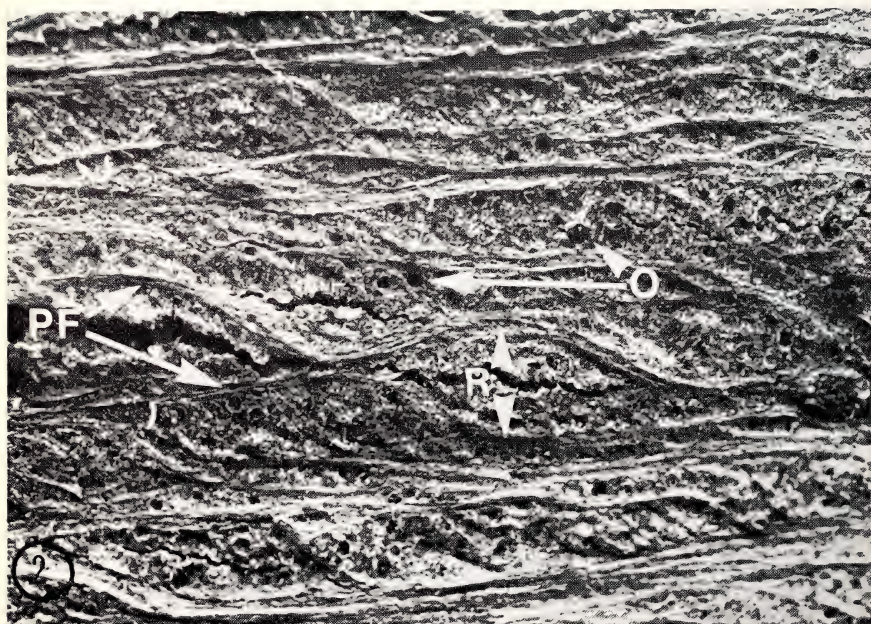
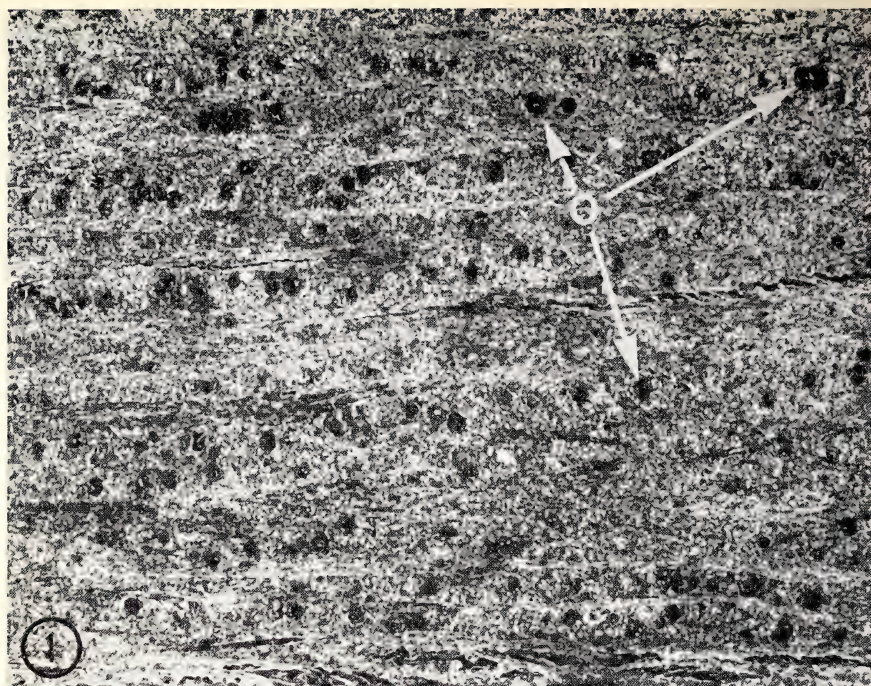


Plate 2. Photographs of surfaces of bark, cleaved parallel to the surface of the trunk.

O = oil gland; PF = phloem fibres; R = expanded ray.

Figure 1. *E. ovata* (x 10).

Figure 2. *E. crenulata* (x 10).

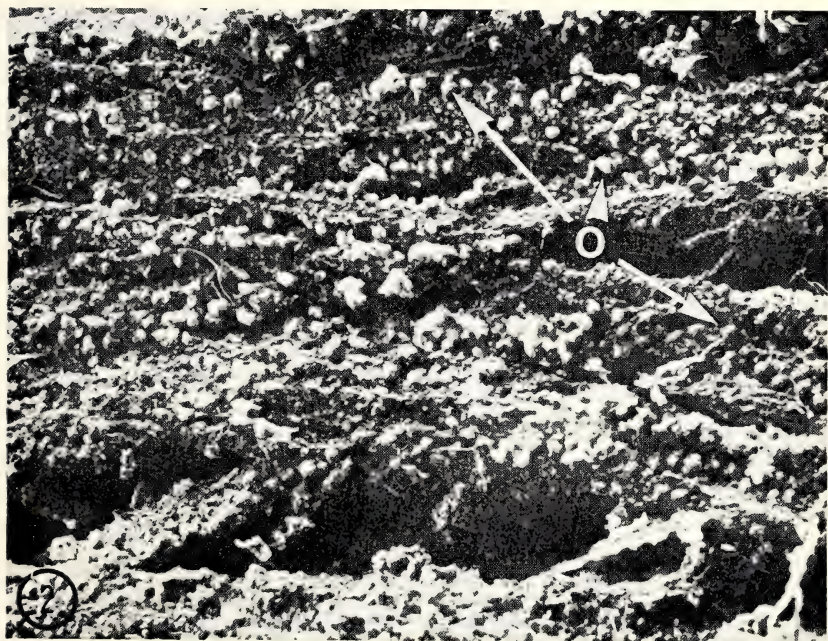
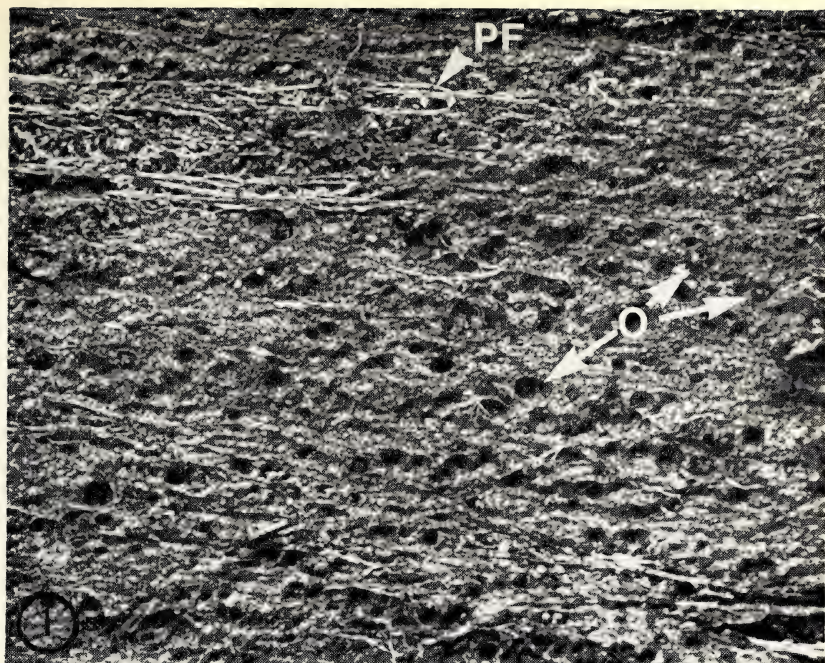


Plate 3. Photographs of surfaces of stem bark, cleaved parallel to the surface of the trunk.
 Figure 1. *E. cephalocarpa* (x 9).
 Figure 2. *E. nortonii* (x 6.8).

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Nature Reserves in Victoria

How much open space can we afford for the protection of scenery and the preservation of nature?

(Text of an address to members of the Field Naturalists' Club of Victoria, 11 March, 1970, by J. Ros. Garnet)

The U.S.A. National Park Service and its system of national parks is regarded by many as the model for other countries.

Australians in general and Victorians in particular are inclined to evaluate their own national parks in terms of the U.S. counterparts and to seek to have them adjusted to the same standard. But what is the standard? Is it one of quality or quantity or both? Whatever the chosen yardstick, one may be sure that, in the eyes of most people our national parks will never quite measure up to it. Perhaps that is as it should be, for thus, there will be always something to strive for.

Let us first consider the question of quality. Have we anything to compare with the magnificent, spectacular

or unique features in the national parks of other countries? The answer will depend upon our interpretation of the adjectives and upon our capacity for wonderment. Those who would reply "No" might well consider that were a foreigner to ask himself the same question in his own country he too would, no doubt say "No". Our attitude is governed by the circumstance that we, like the folk in other lands, inhabit a unique natural environment. Our countryside has indeed its magnificent and spectacular scenery, its elements of uniqueness but, since such attributes are a part of our normal environment, we are apt to deprecate them and, perhaps, even fail to realize that they represent something that is quite peculiar to this great southern continent.

With this thought in mind we might well ask ourselves whether we have kept intact or, at the very least protected, enough of it from the damaging or destroying influences which are part and parcel of the settlement and development of a nation. It is a question which we should strive to answer. Of course, in the process of doing so, we could be troubled by the thought "Why do we want to preserve or protect these things at all?" Possibly some of those who settled on the banks of the Yarra 140 years ago watched with concern the disappearance of their familiar though unique scenery—supplanted bit by bit by all the trappings of a fast-growing human community. Today, who repines the complete suppression of the original native plants and animals that inhabited there? Nobody misses what he never knew and only a few of Melbourne's present million inhabitants will have any conception of what the scene was like so long ago and fewer still, what constituted the Melbourne flora and fauna. Anyway, why should we want to preserve such things?

A one hundred year old building may easily become an object of veneration, a building to be saved for the edification of whom? Posterity? Frankly, I am uncertain whether I can answer the question because I am troubled by the thought that posterity, one hundred years hence, will have at its disposal a colossal number of buildings one hundred or more years old, each with its own special character, legend or tradition. Such things are the product of the skill and craftsmanship of man. He may reproduce them at will but the indigenous trees, shrubs, birds and beasts that once were a part of his close environment, are things he can never resurrect although he can and does readily destroy them.

We are well endowed with sentiment (and I use the word in its best sense). Although we recognize that the passing of the last koala, the last kangaroo, wombat, lowan or lyrebird would not be mourned by the species that yet survived, we ourselves would be deeply concerned should it so happen that the event was brought to our notice. For some 140 years nature lovers have been drawing attention to the gradual extirpation of species of native wildlife and, from time to time, governments have responded by establishing reserves of open space where animals and plants may dwell unmolested and unaffected by the changes going on around them. Those reserves are what we all now recognize as national parks, nature reserves or wildlife sanctuaries—places set aside primarily for the protection and conservation of nature—nature at its best, in its most inspiring garb, in its most interesting and spiritually satisfying guise. We, the human animals, are the only creatures that consciously want these reserves and we want them only that we may, from time to time, visit them to survey our collective conservation handiwork and thereby gain the desired spiritual satisfaction or the anticipated mental stimulus that they afford. We do indeed want them. Thousands of people visit them again and again. In fact, so much are they frequented that there is a considerable danger of their being overrun by the human visitors to the detriment of the very things those visitors come to see and enjoy. The tourist traffic to Wilson's Promontory National Park is now so great as to pose a real problem in maintaining its wilderness condition unimpaired. The problem will be accentuated manyfold in the decades ahead unless the invaders can be encouraged to go elsewhere. But where can they go? What has Victoria to offer them

in lieu of a relaxed and carefree holiday on Wilson's Promontory? — or Mount Buffalo?

There is still a lot of unalienated land of great potential for nature conservation and for public recreation but much of it is waiting to be put to other use—the future farmlands, soft-wood plantations and hardwood forests or for the exploitation of coal and other minerals—oil or uranium or anything at all that is likely to put money into somebody's pocket. Thus we come to examine the implications of the second question. Is quantity a satisfactory yardstick for measuring the degree of sufficiency of our system of nature conservation reserves? At the moment there is little need to use this yardstick in Victoria. We have a long way to go before we need even begin to worry about superfluous acres of national parks. Although we have yet no cause to panic about our deficiencies in nature protection there soon will be if we do not very soon start doing something to remedy them.

Victoria's national parks now occupy 0.9% of the area of the State. However, such a figure is an unreliable guide to the extent of our achievement of a balanced programme of nature protection and conservation. We have no hope at all and, possibly, no need to strive for the 7½% of land surface set aside as national parks in New Zealand or the 5% in Tasmania, but there is still the opportunity for us to establish more national parks without detriment to the economy of the State but with incalculable advantage to its present and future citizens.

Where would we look to find suitable sites?

Our thoughts first turn to our north eastern highlands where 1,400 square miles of territory could be set aside now without seriously disturbing any

vested interest. The people of Victoria and their government have been asked to consider a recommendation by the Victorian National Parks Association that a great Alpine State Park be established without delay. The sense of urgency is dictated by the realization that it is vulnerable to despoliation by mining interests, ineffectively controlled cattle grazing and unplanned tourist development. As a properly managed State Park it could, for centuries, fulfill its vital and present role in preserving the water resources of Victoria!

A Kulkyne National Park comprising about 117 square miles of countryside bordered by the Murray River and including one of its greatest anabranch systems was recommended some years ago but the response to the request was the creation of the 68-square mile Hattah Lakes National Park, most of which embraces mallee land with little more than 700 acres of lake. Failure to include the whole of the Chalka Creek anabranch has tended to vitiate this park. The lakes are now dry or almost so and they are likely to remain so unless the normal sequence of flooding is allowed to take place.

An extension to Mallacoota National Park by approximately 35 square miles is still under consideration ten years after the proposal to extend it was submitted to the government! So long as this proposal is neglected the Howe Ranges and their amazingly rich rain forest associations will remain in danger of destruction by some commercial interest.

Nearly 10 square miles in the Brisbane Ranges await dedication but progress in bringing the proposal to a conclusion has been so slow that whatever eventuates will have but little resemblance to the original conception. It is certain that important biological

communities will be lost because of quite needless procrastination.

Nearly 136 square miles of that remarkably interesting area — the Little Desert — have now been reserved as a national park but, although its size makes it a significant conservation area there still remain several extremely important ecological associations and physiographic features in that 600 square-mile "Desert" that lie outside the boundaries of the new park—simply because those who made the choice never bothered to consult those who knew something about the biological requirements of nature reserves.

Even had all the above-mentioned recommendations been adopted in their entirety Victorians would still be far short of a desirable minimum of nature conservation reserves.

Where else to look? Or rather, what else in Victoria is so outstandingly significant as to deserve, even require, incorporation into the national park system? Are all the major geological formations in Victoria adequately represented in the present and proposed parks? Such formations are the key features we should look for in assessing the deficiencies. Each possesses its own distinctive land forms, scenery and wildlife communities. There is no national park in the Central Highlands — the region of our extraordinary mineral springs. There is no national park to embrace the great Carboniferous sandstone formation so magnificently revealed in the Grampians. There is nothing to typify one of the world's most extensive lava flows—the basalt plains of the Western District and the Keilor and Werribee Plains; little indeed to exemplify the region where occurred Victoria's most recent volcanic activity; nothing to remind us of an event that largely shaped the contours

of a substantial part of the State some 200 million years ago when vast glaciers of Permian times moved across the face of what is now Victoria; nothing to help us to cast our minds back to the very beginning of time when the Cambrian and pre-Cambrian rocks were laid down more than 600 million years ago. Heathcote is the place to see the phenomenon of such rocks exposed for those who wish to see but there is no national park there. At no point along its long course does our greatest river, the Murray, come within the boundaries of a national park. The proposed Kulkyne National Park in the form originally planned by naturalists would have remedied that deficiency. There is no national park containing a representation of a drowning river valley with its attendant swamps and lakes. Rather too late it has been found that the draining of almost every available swamp has not been altogether a blessing.

And so one could go on—enumerating land forms and geological formations, each with some unique character which we deem sufficiently significant and scientifically important to warrant permanent reservation. They are important because each differing formation is stamped with its own characteristic wildlife pattern. Each has its own distinctive scenery.

Is it asking too much to invite the people of Victoria to consider seriously the importance of keeping samples of such regions for the "edification, education and enjoyment" of themselves and, as well, those who are to follow. We think not.

It is surely better that we reach a decision now because the future may be too late. The things we most admire have a disconcerting habit of vanishing before our eyes.

Victorian national parks as at 1st January, 1970

Name of Park	Square miles	Acres	Rods	Perches
Wyperfeld	218.375	139,760		
Wilson's Promontory	188.868	120,875	-2	-20
Little Desert	135.734	86,870		
Hattah Lakes	68.750	44,000		
Mount Buffalo	42.630	27,280		
Lower Glenelg	35.	22,400		
Kinglake	22.026	14,096	-3	-39
Mallacoota Inlet	17.539	11,225		
Fraser	12.103	7,745	-3	-9
Captain James Cook Memorial Alfred	10.469	6,700		
The Lakes	8.447	5,406		
Wingan Inlet	8.184	5,238		
Lind	7.391	4,730		
Mount Richmond	4.503	2,882		
Port Campbell	3.181	2,036		
Mount Eccles	2.734	1,750		
Fern Tree Gully	1.522	974	-0	-20
Churchill	1.519	972		
Glenaladale	0.745	477		
Morwell	0.630	403	-2	-15
Tarra Valley	0.542	346	-3	-2
Bulga	0.492	315	-0	-18
	0.142	91		

Area of Victoria = 87,884 sq. mls. = 56,245,760 ac.

Area of national parks = 791.526 sq. mls. = 506,575 ac. = 0.9007% of the area of the State.

Significant additions approved by Parliament in December, 1969:—

Little Desert 84,000 acres.

Yanakie (addition to Wilson's Promontory) 17,900 acres.

Allotment at Refuge Cove (addition to Wilson's Promontory) 8 ac.
2 r. 20 p.

Rabbit Rock, Ramsbotham Rocks, Dannevig Is., McHugh Is. and Great
Glennie Is. (additions to Wilson's Promontory National Park)
588 acres.

Morwell National Park 5 acres 2 perches.

Fern Tree Gully National Park 11 acres 3 r. 12 p.

Lower Glenelg National Park 22,400 acres.

Captain James Cook Memorial Park (Cape Everard) 6,700 acres.

Kinglake National Park 3 acres, 3 r. 1 p.

Notes on the birds of Big Green Island, Furneaux Group, Tasmania. 1965-1968

by
F. I. NORMAN*

Introduction

Big Green Island lies three miles to the west of Whitemark, Flinders Island at 41°01' S. 147°59' E. (see Fig. 1.). The island, of about 240 acres, has been the site of studies of some aspects of the ecology of *Puffinus tenuirostris*, the Tasmanian muttonbird. The observations presented below, on other species, have been made during the course of this programme.†

The island was visited for one week each month from October 1965 to May 1968; additional visits were made in February and April 1965 (Table 1). Because of other work it was not possible to cover the island completely each day and therefore some species may have escaped attention.

The vegetation and general features of the island have been described elsewhere (Norman, 1966).

Basically the island flora is of a grass-land type, *Hordeum*, *Bromus*, etc., with the coastal tussock belt (see Plates 1 and 2). There is now no extensive indigenous flora, or scrub, and only about half of the vascular species recorded are native. The island is within the belt of prevailing westerlies, having an annual rainfall of around 30 inches and mean temperatures in the range 5.7 to 22.4°C. The sandy soil, derived from underlying granite and dune limestone, has given rise to a vegetation capable of supporting a high stocking rate of sheep which may reach 1,000 in some years though the average lies around 800 (per H. B. Blundstone).

Several Bass Strait islands have been visited in the past (e.g. Mattingley, 1938; White, 1909) but no long-term reports of observations have been published. The present observations

TABLE 1.
Observation periods on Big Green Island, Furneaux Group, Tasmania.

MONTH	YEAR			
	1965	1966	1967	1968
January	27-31	5-12	5-12	4-11
February	1-8	3-10	2-9	2-10, 29
March		3-10	3-9, 30, 31	1-6
April	6-13	1-8, 29, 30	1-6	5-11
May		1-5, 27-31	18-25	3-10
June		1	15-22	
July		5-11	13-19	
August		18-25	10-18	
September		16-22	7-14	
October	7-13	13-21	5-12	
November	5-12	12-19	2-9	
December	2-9	8-14	1-7	

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† Finance for studies on certain aspects of the ecology of *P. tenuirostris* has been provided by the M. A. Ingram Trust and the Frank M. Chapman Memorial Fund and is gratefully acknowledged.

were made both to provide information on the avifauna of a Bass Strait island and to add some data to the little currently known of passerine migration across Bass Strait.

The annotated list given below fol-

lows the R.A.O.U. Checklist (1926). Summaries are given excepting when the species was seen on five or less occasions. Additional records for the species recorded in the Bass Strait region are given in Green (1969).

Systematic list of species observed

R.A.O.U. Number

5. *Eudyptula minor*. Fairy Penguin.

Some 200 pairs nest on the island, mainly on the south-eastern and southern end though they are also present amongst muttonbird colonies along the northern coast.

68. *Puffinus gavia*. Fluttering Shearwater.

At least three birds, thought to be of this species, were seen about 100 yards offshore during strong westerlies in October 1967.

71. *P. tenuirostris*. Tasmanian Muttonbird.

Large rookeries (nesting colonies) occur over the island (see Fig. 2 and Plate 3) and it is estimated that about 10,000 breed. Campbell (1900) and Lord (1908) suggested that there had been a reduction in area covered by rookery. No native mammalian predators exist on the island, and snakes were removed shortly after the island was inhabited (Brownrigg, 1872). Pacific Gulls and Sea Eagles have been observed eating muttonbirds (see below). This predation is light but intermittent "birding" (harvesting of young birds by humans) takes place.

Birds have been observed offshore in early September, (12 Sept. in 1967) and mating individuals seen in October.

79. *Macronectes giganteus*. Giant Petrel.

Seen twice only, 20 October, 1966 and 12 Septemebr, 1967, after strong westerlies on both occasions.

90. *Diomedea melanophris*. Black-browed Albatross.

Observed only once, 12 September, 1967. However a skull found on the northern end was either this species or *D. chrysostoma* (A. R. McEvey, *in litt.*).

91. *D. cauta*. Shy Albatross.

Several individuals were frequently seen feeding offshore after westerlies. They were not recorded throughout the year, and apart from one record in May, sightings were from September to December. The largest number recorded was of 100+ individuals between Green, Cape Barren and Chappell Islands, in September 1967 after westerly gales.

96. *Phalacrocorax carbo*. Black Cormorant.

Seen infrequently offshore around the northern end and along the reef during the late spring and summer, the species presumably breeds in the region though not on Green Island. Green (1959) recorded the species as breeding on the south east of Flinders Island.

99. *P. fuscescens*. Black-faced Cormorant.

A breeding species, nesting on the northern reef. 92 nests were found in December, 1965, formed mainly of *Posidonia*; of these 45 contained young and five had two eggs, the remainder being empty. By October, 1966, there were 69 nests; 16 with one egg, 29 with two and seven with

three, the others being empty. By December no occupied nests were present and activity had shifted to a previous roosting area where there were 46 nests, three with one egg, one with two and one with three eggs. Only two young hatched in the new site and it seems likely that heavy seas were responsible for the desertion of the first site and for the low production of the second, though human disturbance is not to be discounted.

104. *Sula serrator*. Gannet.

Occasional birds were observed during late spring, summer and early autumn.

106. *Pelecanus conspicillatus*. Pelican.

Several birds, with a maximum of six, seen throughout the year.

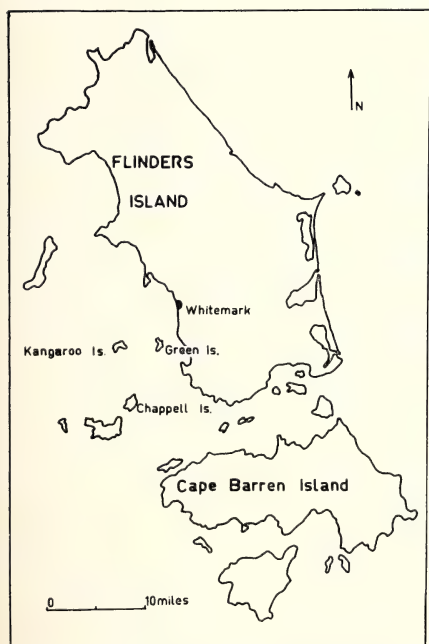


FIGURE 1. Relationship of Big Green Island to Flinders Island, with positions of other islands mentioned in the text.

112. *Hydroprogne caspia*. Caspian Tern.

Three pairs bred on the island. Birds were absent from April to September, eggs were laid in November. One nest, of three eggs, was observed in each year and produced two, one and one young respectively.

115. *Sterna bergii*. Crested Tern.

Large numbers were seen throughout the year, with a maximum of 100+ recorded in February, 1965, but no evidence of breeding on Green Island has been found.

118. *S. nereis*. Fairy Tern.

Several pairs of this species were seen on the island from September to February. Though no nesting has been observed, the aerial butterfly display, an indication of breeding ac-

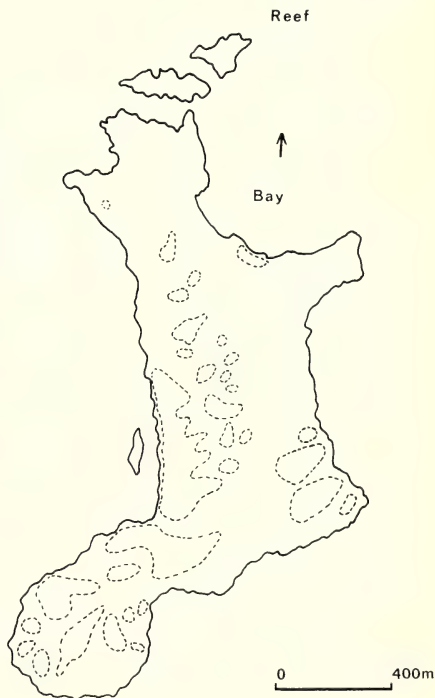


FIG. 2. Distribution of *P. tenuirostris* rookeries on Big Green Island, Furneaux Group, Tasmania, in October, 1965. (The location of the 'Bay' and 'reef', mentioned in the text, is shown.) (Scale 1" = c.440 yards or 400 metres.)

tivity, has been observed on several occasions.

125. *Larus novae-hollandiae*. Silver Gull.

About 200 pairs breed on the northern end of the island but breeding success appears to be low since few young were seen. Possibly egg predation by the Raven was responsible and young were also taken by Harriers and adults by Sea Eagles (see below). Though several birds were present throughout the year, there was a marked decrease in numbers after April and a corresponding increase in September.

126. *L. pacificus*. Pacific Gull.

At least two pairs breed in the northernmost reef, two young and two eggs being found in December, 1965, two eggs in October, 1966, and one egg and one young in December, 1967. During the November to January period the island received a large influx of young to the extent that, in November, 1966, 70 per cent of the island total of 31 birds were immature.

The Pacific Gulls role as a predator of muttonbirds is limited, though it has been observed eating young. An opportunity was taken during the muttonbirds' 1966-1967 breeding season to assess the predation caused by this species. A rookery was kept under observation for one half hour before dusk and Pacific Gull numbers noted. It was intended that muttonbird corpses would be counted and expressed as a percentage of the breeding total. None was found and the only predation seen, two young taken from burrow entrances, took place in a neighbouring rookery. The patrolling behaviour of gulls, in which burrow entrances are searched, is opportunistic in that only birds immediately at the entrance would be attainable. Insects are also taken during patrolling activities

129. *Arenaria interpres*. Turnstone.

Only two seen during the programme, on 4 December, 1967.

130. *Haematopus ostragalus*. Pied Oystercatcher.

The island had a breeding population of about ten pairs which remained throughout the year and large flocks occurred during August. Copulation has been observed in October and eggs found in November, but apparently pairing-off occurs before this. From July onwards, pairs indulge in aerial display. Nests of this species and of the Sooty Oystercatcher, were found slightly above high water and usually contained three eggs; one, on a sheep track about 20 feet above H.W.M., was not successful.

131. *H. unicolor*. Sooty Oystercatcher

Approximately ten pairs bred on the island in each year. The display flight described for the Pied Oystercatcher has been observed from August onwards and mating seen in October.

133. *Lobibyx novae-hollandiae*. Spur-winged Plover.

Considered to be a breeding species though only one flying young has been found. The island population was around 15 with a maximum of 31 recorded in May, 1966; the total fluctuated since the birds moved around the islands and to the mainland of Flinders.

136. *Squatarola squatarola*. Grey Plover.

Seen once only, on the reef, 15 October, 1966. This species was not recorded for Flinders Island by Green (1969).

138. *Charadrius cucullatus*. Hooded Dotterel.

Seen infrequently in January, March, April, November and December.



PLATE 1. The coastal tussock belt on Big Green Island, south-east coast, January, 1966.



PLATE 2. View of the main vegetation type on Big Green Island, grassland on the western side of the island, November 1966. Chappell Island in background.

140. *Charadrius bicinctus*. Double-banded Dotterel.

Seen frequently throughout the year, excepting November to February, with maxima of 20+ in June and July, 1966.

143. *Charadrius alexandrinus*. Red-capped Dotterel.

Small numbers, never exceeding four, seen throughout the year. Possible breeding occurs since a young-plumaged bird was present in December, 1967.

149. *Numenius madagascarensis*. Eastern Curlew.

Present in small numbers in almost every month though not between June and September in 1966 and August to November in 1967. Parties, never exceeding 25, were usually observed feeding in the bay and on the northern reef.

150. *Numenius phaeopus*. Whimbrel.

One seen on the reef in October, 1966.

155. *Tringa brevipes*. Grey-tailed Tattler.

Eight seen in January, 1967, around

the reef and in the bay. Green (1969) did not record this species for Flinders Island.

162. *Erolia ruficollis*. Red-necked Stint.

Thirteen birds were seen in April, 1966, three in May and 12 in January, 1967.

188. *Notophox novae-hollandiae*. White-faced Heron.

Small numbers seen throughout the year though only one or two were present from October to January. In May, June and July the island population in each year sharply increased to a maximum of around 50+ though over 100 were present in May, 1966. The numbers then decreased, possibly indicating a post breeding dispersion.

198. *Cereopsis novae-hollandiae*. Cape Barren Goose.

Guiler (1967) has discussed the status of the species within the Fureaux Group. It would appear that he considered that Green Island has about ten breeding pairs of geese (about one every 24 acres) which



PLATE 3. Typical rookery of the muttonbird, *Puffinus tenuirostris*, on Green Island. Note the utilization of the deeper soils between granite boulders and ridges. January 1966.

produce ten chicks. In this regard it is of interest to compare my findings with Guiler's estimation.

In the 1965 breeding season, nests with eggs, and families of chicks were found in October. There were at least 25 young present in November. Copulation was first observed in July with nests being formed in August, in 1966. Both young and eggs were present during the September visit and a minimum of 18 young were produced during this breeding season. In 1967 at least 23 young were present in November, though nests with eggs and young had been found as early as August. Twelve nests were found during the season and produced, at some stage, 30 young. Since Guiler (*ibid.*) based his estimation on one visit during August, it seems likely that many young resulting from later nesting were missed.

During the observation period, estimates of the maximum number of geese inhabiting the island (during the week's visit) have been made and these are presented in Table 2. It

will be seen that the island carries a goose population through the year though numbers are low around the dry summer period. A peak, which reached 200+ birds in 1967, has appeared in both years prior to the breeding season and presumably relates to breeding and non-breeding birds moving through the island, possibly from Flinders Island, to nest on outer islands. This movement may be stimulated by heavy rainfalls following relatively dry conditions since in 1966 and 1967 the peaks were obvious after heavy rains in February, March and May respectively. The mean number present in 1965 was 46, for 1966 the figure was 54, in 1967 the mean was 67 and in 1968 a mean of 82 was recorded.

The island, during my observation period, has carried about 12-15 breeding pairs and produced between 20 and 30 young per season. As a feeding area for local migrants, the island reaches its peak importance shortly before the breeding season but supports mainly breeding pairs for the remainder of the year.



PLATE 4. Eastern side of the island showing the grassland merging into areas colonised by the alien *Lycium ferocissimum*, November, 1966.

Natural predation on the island appears to be limited to egg losses caused by the Raven but young and adults are frequently shot by local residents.

203. *Cygnus atratus*. Black Swan.

Almost all birds were seen feeding on *Posidonia* and *Zostera* beds, in the Bay on the north eastern side though swans were occasionally seen on the grass at the northern end of the island. Usually about five or six birds were present but at least 28 were seen in January, 1966, and a maximum of 15 in March, 1967. Ashby (1928) recorded this species as migrating between Flinders Island and the Victorian mainland.

Small cygnets have been seen during 1966 and 1967 but since no nest was found on the island it is thought that these were bred on Flinders Island.

208. *Anas superciliosa*. Black Duck.

Two birds seen on three occasions, in May and October, 1966, and in April, 1967.

210. *Anas castanea*. Chestnut Teal.

Small numbers seen throughout the year, with a maximum of 31 in May, 1966, and 20+ in May, 1967.

211. *Anas gibberifrons*. Grey Teal.

Occasional birds seen in almost

every month though totals rarely exceeded ten birds. At least 40 were present in November, 1965, and 30+ in May, 1967 and 1968.

215. *Aythya australis*. Hardhead.

Seen in small numbers around the Bay in most months, though a maximum of 20 birds were present in January, 1967.

217. *Biziura lobata*. Musk Duck.

Two to ten birds seen monthly in the Bay.

219. *Circus approximans*. Swamp Harrier.

One or two birds regularly visited the island, from Flinders Island, during the September-February period but they were not seen there in the intervening months. Ashby (1928) and Ridpath and Moreau (1966) note that this species migrates across Bass Strait.

The harrier was a predator of the rat, *R. rattus*, on the island and was also observed preying on a young Silver Gull.

226. *Haliaeetus leucogaster*. Sea Eagle.

One or two birds were seen on almost every visit, flying in from or returning to the Strezlecki Mountain region on Flinders Island.

The species has been seen fishing on the Bay; on one occasion caused a

TABLE 2.

Maximum counts of Cape Barren Geese on Green Island for the period 1965 to 1968.

MONTH	YEAR			
	1965	1966	1967	1968
January	70+	87	60	50
February	62	27	?	30
March		2*	7	48
April	44	172	60	150
May		86	50	130+
June		36	200+	
July		78	?	
August		43	100+	
September		50	40+	
October	37	28	50+	
November	32	?	40	
December	48	30	40	

* No estimate made; gaps indicate no observations (see Table 1).

Pacific Gull to disgorge a fish which the eagle retrieved. In January, 1967, an eagle took an adult Silver Gull from a flock on the water, plucked the prey on a rock at the northern end and then flew towards Flinders, being mobbed by a flock of 200+ Silver Gulls, Spur-winged Plover and a Swamp Harrier. R. Marriott (*pers. comm.*) has seen adult and young muttonbirds being taken by the species in December, 1967, and March, 1968, respectively.

228. *Haliastur sphenarus*. Whistling Eagle.

Seen during February, 1966 and in March, 1968 (eating a rat).

237. *Falco peregrinus*. Peregrine.

One or two birds seen infrequently throughout the programme.

239. *Falco berigora*. Brown Hawk.

Usually two birds seen during each visit, occasionally observed carrying rats. Food passing between males and females have been seen in January and March.

240. *Falco conchroides*. Nankeen Kestrel.

This species is not known to breed in mainland Tasmania (Ridpath and Moreau, 1966) but it is present on Flinders Island. One or two were seen over the island in almost every month.

242. *Ninox novae-hollandiae*. Boobook Owl.

Dr. D. F. Dorward recorded one in 1967.

306. *Neophema chrysostoma*. Blue-winged Parrot.

Two birds seen over the island in November, 1965, were the only records of this species.

337. *Cuculus pallidus*. Pallid Cuckoo.

A migrant species (Ridpath and Moreau, 1966) which surprisingly was only seen once, on 11 September, 1967.

357. *Hirundo neoxena*. Welcome Swallow.

Small parties of birds have been observed flying north in February, March and April and returning south in August and September. Occasional birds seen in November are, presumably, local breeders.

359. *Hylochelidon nigricans*. Tree Martin.

Mollison (1960) recorded large numbers of birds flying NNE into a wind, between Flinders and Cape Barren Islands in late February. The only records of the species over Green Island support this timing, being of two birds going northwards on 9 February, 1966, and 8 March, 1967.

361. *Rhipidura fuliginosa*. Grey Fantail.

Occasional birds were present on the island, feeding around the prickly box bushes, from August to October and again in April, probably on migration, though Green (1969) considers that they are common on Flinders Island throughout the year. Observations were usually of individual birds but at least four were present in October, 1966.

365. *Myiagra rubecula*. Leaden Flycatcher.

Single birds seen in March and April, 1966.

382. *Petroica phoenicea*. Flame Robin.

Ashby (1928) mentioned that this species migrated across Bass Strait. Birds, usually single, were present on the island in April (1965 and 1966) or (May 1966) and again in October.

448. *Ephthianura albifrons*. White-fronted Chat.

Though small numbers may breed on the island (birds carrying food have been seen in December), no nest has been found. Chats were seen throughout the year, with a maximum

of about 20 in March, April and May. Birds have been observed flying out towards Kangaroo and Chappell Islands and it seems likely that there is considerable inter-island flight in the species.

547. *Artamus cyanopterus*. Dusky Wood Swallow.

A flock of 100+ moved north over the island on 8 May, 1968.

574. *Zosterops lateralis*. Silver-eye.

Ashby (1928) noted that it had been seen crossing the Straits and Ridpath and Moreau (1966) mentioned its habits of partial migration, with some portion of the population remaining within Tasmania over the winter period. On Green Island, small numbers have been seen in every month except November, December and January, with the majority being present in April. These usually inhabited the prickly-box *Lycium ferocissimum* (Plate 2). A flock of more than 200 were seen over the island on 12 April, 1965; they were flying (and calling frequently) at about 500 feet towards the south-east, shortly after dawn. In 1966 no birds were present until March, in 1967 only single birds were observed in February and March and in 1968 the earliest birds were seen in April.

647. *Anthus australis*. Australian Pipit.

A few birds, usually less than five, were seen infrequently in every month excepting January and February.

648. *Mirafra javanica*. Horsfield Bushlark.

Single birds seen during August, September and October, 1967. This was apparently a vagrant since the species is absent on the Tasmanian mainland (Ridpath and Moreau, 1966).

690. *Corvus coronoides*. Raven.

A few birds were seen throughout

the year, often flying between Green Island, Flinders, Chappell or Kangaroo Islands. Large flocks, up to 34 birds, appear during the lambing season and small parties clean up refuse left by muttonbirders.

As recorded by Guiler (1967), this species is an egg predator of the Cape Barren Goose. A pair were observed smashing eggs near a nest on the western side of the island (other nests found with broken eggs were possibly the result of the Raven). The birds also apparently take insect larvae from soil, eat dead rats and sheep and scavenge along the shore. Once a pair were observed eating a dead Conger Eel, *Leptocephalus wilsoni*, which had been stranded on the shore.

696. *Strepera arguta*. Clinking Currawong.

One bird observed on 6 February, 1966, originating, probably, from Flinders Island.

Introduced Species

991. *Turdus merula*. Blackbird.

A pair, possibly two, occupied the prickly box thicket on the north east (Plate 4) and it was likely that they bred there.

993. *Alauda arvensis*. Skylark.

Probably a breeding species of about ten pairs, though no nest has been found. The island population seems to be constant around 20 birds but influxes occurred in April and May. In April, 1966, about 100 birds were present and were watched leaving the island towards the north-east.

995. *Passer domesticus*. House Sparrow.

One or two birds occurred on the island throughout the year, excepting the summer months.

996. *Carduelis carduelis*. Goldfinch.

Generally small numbers throughout the year but larger flocks, of up to 40 birds, were present on the island between August and October.

997. *Chloris chloris*. Greenfinch.

Not uncommon on Flinders Island (Tarr, 1950), the species was seen on only one occasion, 6 July, 1966.

999. *Sturnus vulgaris*. Starling.

A breeding species (two pairs) in 1965 and 1966, though not in 1967. The island was utilised as a feeding area by large flocks of birds from Flinders Island, which reached c.400. The birds roosted on Kangaroo Island and flocks crossed Green Island towards Kangaroo before dusk each night in the non-breeding season.

Discussion

The results presented above, from a three year observation period, indicate the limited avifauna of one Bass Strait island. During this study 62 species have been observed, including six exotic species. Of the total, thirteen species breed on the island, including Starling, Blackbird and Skylark, and another four are thought to do so. Only one native passerine is included in the breeding list.

This may be compared with the list presented by Green (1969) in which 88 species have been found breeding on Flinders Island and about 151 species of birds have been recorded from the Furneaux Group.

It would seem that the island has suffered a reduction of scrub since its first contact with white man (cf. Backhouse, 1843 with Norman, 1966). Certainly the native portion of the flora has declined as the island has been cleared and stocked. The decrease of the endemic flora has not benefited native species of birds, excepting possibly the Cape Barren Goose. The increase in alien plant species on the other hand has certainly benefited exotics such as the Skylark and Blackbird, which have colonised the island. Other alien species use the island as a feeding habitat.

Final consideration of the importance of Green Island in the trans-Bass Strait migration is limited by the lack of knowledge concerning the overall structure of the migration itself. It is also limited by the lack of comparative data which are required before generalisations can be made.

Abstract

Observations of 62 species of birds seen on Big Green Island, Furneaux Group, Tasmania, during the period 1965 to 1968 are presented.

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Death of Mr. A. G. Hooke

Arthur Garnsey Hooke, a Club member since 1920 and its treasurer for 16 years from 1950 to 1966, died on 12 April last. A tribute to Mr. Hooke and his membership and service will appear in a future journal.

A note from Mr. J. Jones is published below. [Ed.]

Appreciation of A. G. Hooke

Garnsey Hooke was a unique man in my experience of many men in natural history, in business, and socially. He was markedly different in his personality of gentlemanliness, objectivity, patience, persistence, diligence, competence and other qualities. Above all he was characterized by gentlemanliness. He was innately courteous, disciplined, scrupulous, never pretentious — a gentleman in true manner.

My closest affinity with him was in bushland matters for The Sir Colin Mackenzie Sanctuary, Healesville; particularly in recent years with investigations towards eventual public access to the bushland through a system of walking tracks with natural-history exposition.

I first met Garnsey in 1956 when as a member of the Sanctuary's committee of management I was assisted

by a F.N.C.V. work party, including Garnsey, in establishing a nature trail in the Sanctuary bushland. His interest in the Sanctuary persisted and widened, and in early 1961 he became a committee member. He was active immediately, continually and effectively in Sanctuary affairs, notably in three areas. His professional experience in accounting, auditing and insurance was applied to finance analysis and budgetary control; he gave close attention to details for fauna exhibition and improvement; and his love and knowledge of the bush made him an ever-willing participant in exploration and assessment of the Sanctuary's 380 acres of forest. His service to the Sanctuary was great and I believe irreplaceable in one man. He will be missed, and he will be remembered.

—Jack Jones.

Field Naturalists Club of Victoria

General Meeting

13 April

About one hundred and twenty members and friends were present and Mr. T. Sault, the president, was in the chair.

He announced the death of Mr. Frank Zirkler, and of Mr. A. G. Hooke. Members stood for a minute in silence in respect to their memory.

Mr. Sault said that Mr. Zirkler had been in office in the Botany Group and a conspicuous worker in the Nature Shows. He had been active in contacting new members and making them feel at home.

Mr. Ros Garnet said that Mr. Garnsey Hooke was one of the most active members. When in the A.I.F. in Egypt in 1915, he met a Field Naturalist in his Unit who urged him to join the Club. He became a member when he returned home.

After years in office he was elected an honorary member because he had given so much service to the F.N.C.V. in his position as Treasurer for many years. As an accountant, he had arranged the financing and production of many of the Club's works. He represented the Club on the Natural History Medallion Committee. The Club owes a great debt of

gratitude to him in helping it through difficulties.

Mr. A. J. Swaby also spoke of Mr. Hooke's help in 1956 in the preparation of Nature Trials in the Sir Colin McKenzie Sanctuary. He was an officer on the Committee.

The president reported that Mr. Alan Morrison was recovering from a serious eye operation. The good wishes of members go to him for complete recovery.

Miss Florence Smith, a long standing member, who worked with Miss Jean Galbraith, is ill in the Hedley Sutton Hospital behind St. Mark's in Canterbury Road, Canterbury. Some members may be able to go and see her.

Mr. D. McInnes announced that the Council will invest \$1500 in publishing Mr. J. Ros Garnet's book on the plants of Northern Promontory.

The subject for the evening was "From Gibbers to Greenery" (Birdwatching across Northern New South Wales and Southern Queensland) by Miss Helen Aston.

Six ladies in two ordinary cars travelled two and a half thousand miles from 13 September to 4 October, 1969. They carried 22 gallons of water, food, numerous spare parts, petrol and camping gear. Running repairs were executed on the spot with the aid of nail files, a singlet and tape.

A map showed the route through Mildura to Broken Hill, Milparinka, Tibbooburra Teurika Homestead, the Bulloo River overflow, east to Wanaaring on the Paroo, up through Hungerford gate in the border fence to Cunnamulla in Queensland, back through Hebel to N.S.W., Lightning Ridge, Walgett and to the Warrumbungles.

Colour slides taken by the party showed contrasting habitats. Many of the birds seen were shown in slides from Bird Observers' Collections. Wedgebills and the Red-backed Kingfisher were seen near Broken Hill. North from there pictures showed gibber country and Sandy Creek crossings, dry except in rainy seasons. These had red gums with Major Mitchell cockatoos and Mulga parrots. Near Packsaddle were Cassias, acacias and casuarinas. *Acacia ligulata* bushes showed guttering due to wind blowing around. A brown cuckoo shrike was amongst the birds seen. The introduced *Nicotiana glauca* attracted Yellow Throated Miners and other honey eaters.

Also seen were Black-faced Wood Swallows, Blue Bonnet Parrots and Crested Bronzings. The bar of Packsaddle race course was made from cane grass *Eragrostis Australasica*. Milparinka showed one composite functional building and ruins of the gold mining town. In 1845 Sturt stayed for six months, his scouts trying unsuccessfully to find other water. Poole died from scurvy.

To the north Tibbooburra, encircled by low ridges with big boulders, is a fair town with amenities. The gibber bird—a recently described new Australian species was here. Three nights were spent in the woolshed at the Teurika Homestead of Mr. and Mrs. Whitehair.

Near the Adelaide gate in the border fence there was low salt bush with Orange Chats and Emu. Water channels had azolla on them and a Pratincole was seen. Cane grass stretched for miles—a very useful thatching and building material for early settlers who used it with mud for walls. The Bulloo River overflow is an extensive area and here were seen Red-Kneed Dotterel, and the Grey Grass Wren first recorded by Mr. N. Favaloro a few years ago. Beyond the Cane grass, *Atriplex nummularia* (old man salt bush) had Blue-Winged Parrots in numbers feeding on it.

Extensive wind blow outs, in places covering fences, exposed aboriginal implements, and two big grinding stones with grooves in which smaller stones were rubbed were discovered. Over the gibbers to the Mulga they encountered salt pans, a bearded dragon being seen on the way. Crimson Chats were in the Mulga.

Near the Paroo River at Wanaaring were flocks of White-browed and Masked Wood Swallows.

Shiny leaved Bimble Box trees were in the black soil and Mudlark, Wood Duck and wild pigs were seen. One picture showed a cluster of Fairy Martins on a dead tree in the water. Ringneck Parrots, Cockatiel, Grey Teal, White-breasted Wood Swallows were seen. Lignum and Box edged the Paroo. Through the Hungerford gate on the border fence into Queensland en route to Cunnamulla there were acacias cassias and everlastings.

Double-barred Finches, Black-backed Wren, Chestnut-breasted Quail Thrush, and Hall's Babbler (recently described as a new Australian species) were seen,

and leaving Cunnamulla, Black-chinned Honeyeaters, Orioles, Little Wood Swallows, Pale Headed Rosellas, Banded Plover and Pied Butcher-bird were recorded with White Cockatoos back near the border.

Lightning Ridge in N.S.W. showed "Opals *iv* Sale". With its vegetation, it is more attractive than other opal towns.

Red-winged Parrots, Western Warbler and an Oriole mimicking the Spotted Bower bird were in this vicinity.

A Spotted Bower bird's bower had three sections, a central inner one, a front, and a back. The centre had roofing nails and wind screen pieces, the back had vertebrae of animals, and the front had white chalk.

Across the Darling River was the Pilaga scrub—a forest reserve with Murray pines. Pictures showed *Helipterum floribundum* and acres of *Carpobrotus*. Birds included the Striped Honey-eater.

Pictures of the Warrumbungles National Park showed grand high tops and spires (remains of an old volcano), Bluff Mountain and Mt. Exmouth, just under 4000 ft. The Bread Knife is a very thin long projection. The Park has tracks and markers on trees.

Muelenbeckia with reddish leaves, Hardenbergia and Bursaria with antherohoea (grass trees) on the dry slopes were shown. The Turquoise Parrot, Crimson Chats and Apostle birds were here.

The President thanked Miss Aston for the interesting talk and members showed their appreciation in enthusiastic applause.

Mr. I. Morrison projected the slides.

Exhibits

Mrs. I. Cameron brought copper minerals: Malachite (Congo) and Cuprite, chalcocite and azurite from north-west Queensland.

Mrs. North—Smoky Quartz (Gladstone, North-East Tasmania). Opalized wood (Campbell Town, Central Tasmania).

Mrs. Swaby—a collection of fungi—*Fomes rimosus*, *Schizophyllum commune*, *Phliota spectabilis*, *Ramaria ochraceo*, *salmonicolor*, *Polystictus zonatis*, *P. versicolor*, *Trametes cinnabarina*, and a lichen, *Usnea florida*.

Mr. I. Morrison—Larva, pupa and adult Wanderer butterfly (female), *Danaus plexippus*.

Miss I. Dixon—male Wanderer butterfly and common drow (*Heteromorphamerope*).

Mr. P. Curlis—self-sown fern—unknown parentage.

Mr. T. Sault—Rhinoceros beetle.

Mrs. McInnes—large shell (*Campanile symbolicum*) from Albany area, Western Australia.

Mr. Gary Wallace—fossil wood (Flinders Island).

Mr. Ken Strong showed under the binocular microscopes male and female

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fig wasps and the head of a female fig wasp from a Moreton Bay fig.

Fifteen new members whose names appear in the April Naturalist were elected.

Mr. Baines reported that the "Australian" newspaper had articles on aboriginal art, pointing out the antiquity of the works probably before the current race of aborigines.

Dr. Wanliss announced a Fauna Conservation meeting on 22 April with pictures of North-West Australia.

Mr. Swaby said that he would have plants of *Pratia surrepens* to give to anyone who wanted them.

Mr. W. Woollard requested action on the public address system which was not functioning. Mr. A. J. Swaby supported the request.

Botany Group Meetings

12 March

There were 22 members and visitors at the March Botany Group meeting. The subject for the evening was a talk by Mr. Jim Willis, "Botanical Personalities in Australia". The opening remarks dealt with the value of plant specimens for herbarium purposes. There is little value till the name is added. The locality (including habitat) is very important and the date and month of flowering is useful. The name of the collector is less important than that of the determinant. When both are the same this adds to the value. For example the Melbourne Herbarium has implicit trust in the accuracy of such a collector and determinant as Mr. Cliff Beaglehole. The handwriting and background of travel and experience can be useful.

The speaker said he was not going to deal with such well-known names as Brown, von Mueller, Gunn, etc., but with minor botanists who lived and worked (and usually died) in Australia. Of these the "lady-collectors" predominated. From Western Australia there was **Miss Sarah Brooks**, who arrived in Esperance as a child of four in 1874 and collected in the lonely Mt. Baggett area north of Israelite Bay. Her name is honoured in *Scaevola brooksiana*. She wrote to von Mueller for over thirty years. The second was **Miss Annie Cronin**, now Mrs. Walker, a matriarch of 99 years and still alive. The third selection was **Mr. Charles Austin Gardner**, born 1896, who died very recently. He came to Western Australia in his

twenties and was first a collector for the Forestry Department, then botanist to the Agricultural Department and finally Government Botanist in Western Australia. By 1965 he had discovered seven new genera, 125 new plants and had a pile of 200 awaiting description.

From South Australia, the chosen botanists were **Johann Otto Tepper**, who was a teacher in the Education Department for many years and finally became Government Entomologist. Also from South Australia was the **Rev. Hermann Kemp**, who went to Central Australia in 1875 with the first expedition of Lutheran Missionaries.

The Victorian collectors mentioned were first another German, **Johann Paul Eckert**, who was a musician and artist, leaving a collection of beautiful coloured prints of grasses. He collected in the Wimmera and Glenelg River area (1890's). The second botanist was **F. M. Rieder**, an aristocrat who ended sadly. He was a foundation member of the F.N.C.V. and studied the flora of Studley Park and later the Wimmera, including studies of flowering plants (especially grasses), mosses, liverworts and fungi. One of the "lady-botanists" was Mrs. Annie McCann (nee MacDonald) who lived at Granite Flat, Mitta Mitta, ran the hotel, P.O. and store wrote flamboyant poems and letters and collected botanical specimens. **James Stirling** was a geologist in Victoria's north-east and lived at Omeo. He was a member of the Royal Societies of Victoria and of London and was responsible for the opening of the black coal deposits in the Wonthaggi area and reported the Gippsland Brown coal. He wrote on the Phanerogamia of the Mitta Mitta source. *Helichrysum stirlingii* was named after him.

Joseph Milligan, 1807-1884, from whom we get the genus *Milligania* (*Liliaceae*) and *Helichrysum milliganii*, belonged to the Van Diemen's Land Co. in Tasmania, was Superintendent of convict discipline, protector of aborigines and was responsible for sending them to Flinders Island. **Raleigh Black** was an expert Tasmanian botanist, though he left school at 3rd or 4th grade. After various vicissitudes he ended up in the Pivot Phosphate Co. in North-East Victoria where Mr. Willis tarvelled with him in 1938, finding him versatile in conversation and an amiable companion.

From New South Wales we have **William Lockhart Morton**, 1824-1898,

a foundation member of the Royal Society, from which he resigned as a gesture of protest against the Burke & Wills Expedition. He travelled and botanised in arid conditions in the Mallee and on up to the Mackay district in Queensland. Another from N.S.W. was **Wilhelm Bauerelan** who was official collector for the N.S.W. Museum of Technology and collected thousands of specimens.

In Queensland, the two botanists mentioned were **Karl Heinrich Hartmann**, a nurseryman from Toowoomba, a prolific collector, who collected the type specimen of *Sarcochilus hartmannii*, and **Mrs. Harriet Biddulph**, 1839-1940, who at 101 years needed no spectacles and was still a gardener. *Hemigeinia biddulphiana* was named in her honour. She had collected at Mt. Playfair where she lived in Central Queensland.

The bare bones of facts about these botanists were clothed with racy little anecdotes of their occupations, lives and characters, so that the expectant audience of the Botany Group was not disappointed by Mr. Willis' instructive and highly entertaining talk.

9 April

There were 19 members present with Mr. Fairhall as chairman. He reported the death of Mr. Frank Zirkler, who had been an active and keen member of the group, always ready to offer his help when there was work to do and to give a friendly welcome to newcomers. It was decided that the Botany Group should give a book to the library in memory of Mr. Zirkler.

Various business matters were dealt with and a proposed week-end excursion to Wilson's Promontory from 6th to 8th November was confirmed.

The subject for the evening was "The Family Myrtaceae" presented by Miss M. Lester. After stating the importance of Myrtaceae to Australia and a brief answer to the question "What is a Family?", Miss Lester showed slides of familiar Victorian genera. The family characteristics of the flower, fruit, leaves and habit of growth were examined in turn with each main genus. The differences between the genera *Eucalyptus* and *Angophora* and between *Melaleuca*, *Callistemon* and *Kunzea* were explained with slides that clearly demonstrated those differences. The genera *Leptospermum* and *Baeckea*, and the genera *Thryptomene* and *Micromyr-*

tus were similarly treated. Lilly-pilly was shown as the only Victorian species with a berry instead of the more usual Australian fruit of woody capsules in *Eucalyptus*, tea-trees, etc., or the small nut of *Thryptomene* and *Calytrix*. Miss Lester concluded her talk by showing slides of two unusual flower forms from Western Australia, a species from tropical South America—the other country that is very rich in Myrtaceae and, finally, *Myrtus communis* from the Mediterranean region. *Myrtus* is the genus from which the family name is derived.

The chairman thanked Miss Lester for her clear, interesting and informative talk and beautiful slides.

Geology Group

4 March

Fifteen members attended with Mr. Davidson occupying the Chair. The meeting took the form of a members' night. The short talk on Lateritic deposits by Mr. Kerry Hammond aroused much interest. He gave the requirements necessary for the formations of Bauxite, Iron and Nickel under conditions. They are as follows—

A flat topography, a 75° temperature average, a high average rain fall with a high absorption rate, and a fluctuating water table. The other requirements are—host rocks for Bauxite; an aluminium rich claystone; for Iron; an iron rich Jaspellite; and for Nickel; a Gabbro-Norite rock. The water table should fluctuate about 25 ft. between wet and dry seasons. This continues to dissolve and redeposit the material from the host rock. The Geological structure must be such that it contains the enriched material within closed limits. The Bauxite deposits at Weipa are an example of lateritic deposition. Mr. Hammond said these deposits took a granular form, often termed Pisolithic. He said also that the deposits at Weipa were initiated in late Cretaceous times and were still continuing.

Mr. Davidson gave an account of visits to Queensland and Tasmania and spoke of specimens collected.

These included — Opalized Wood; Rockhampton, Qld. Variegated Rhyolite; Rockhampton. Hyalite (Colourless Opal); Qld. Crocoite; Dundas, Tas. Serpentine, Stichtite, Chrysotile; Rosebury, Tas.

Mr. D. McInnis showed a rock section under polarized light of the mineral Actinolite.

Marine Biology And Entomology Group 2 February

The meeting was Chaired by Mr. R. Condrón, 20 members being in attendance.

An apology was received from Miss Jenny Forse.

It was announced that Dr. Brian Smith would lead the F.N.C.V. Marine Biology excursion to Sorrento on Sunday, 5th February.

The Secretary announced that, as yet, he had been unable to obtain a speaker for the March meeting. Mr. H. B. Wilson, Senior Entomologist, Burnley Horticultural Gardens, will be the speaker at the April meeting, his subject as yet to be decided.

The Chairman thanked Dr. Brian Smith for giving the Group Secretary early notice of the availability of a room at the Museum for Group meetings.

Exhibits

Mr. J. Strong—a small black spider with white spots on its abdomen taken at Pt. Addis.

Mr. R. Condrón—larvae of the Wood White butterfly (*Delius aganippe*) which he had obtained from Tallarook.

Mrs. Z. Lee—some unidentified species of spiders.

Mr. D. McInnes showed a species of Ant Lion and a species of Robber Fly. Also a protozoan under his microscope (species: *Pixicola*), and gave a short talk on it.

Mr. K. Strong—some beach sand shown microscopically under polarized light.

Miss L. White—a species of tick taken from a lizard.

Mr. D. Long—some small species of snails collected on the F.N.C.V. outing to Cumberland Falls; and also microscopic snails from Tonimbuk.

Dr. B. Smith—a marine bivalve from South Australia, a new species, as yet not described. This is one of the "Watering Pot" shells from near Port Lincoln. Dr. Smith said that up to date there were nine species in this family, most being dredged from 6-8 fathoms.

Mr. J. Selfard—a series of colour transparencies showing the sequence of the emergence of a cicada.

Dr. Brian Smith then projected a series of slides on plankton and explained how a method of cultivation of same was being undertaken in England and he described the method of breeding in

a laboratory. Dr. Smith also showed some very interesting colour transparencies taken from plates of old books on Conchology. Many slides of *Coelenterata* (jelly-fish) were shown, and Dr. Smith gave a short talk on the habits of them. He also gave a short and very interesting talk on salps.

At the conclusion of this talk, Dr. Smith was thanked by Mr. J. Strong.

2 March

Mr. R. Condrón took the Chair, 22 members being in attendance.

The Secretary conveyed the sympathy of the Group to Mr. & Mrs. Long on their recent bereavement.

Mr. McInnes spoke on the Club outing to Sorrento on 15th February which was led by Dr. Brian Smith, who spoke on the various marine specimens collected.

Dr. Brian Smith gave a short talk on the effects of D.D.T. on marine life.

Exhibits

Mr. J. Strong—two species of Nudi-branches (*Ceratosoma brevicaudata* and *Doriopsilla carneola*) which were collected on an excursion to Ricketts Pt. by the Hawthorn juniors led by Mr. D. McInnes. Also two species of Chitons (*Ischnoradsia australis* and *Poneroplax albida*) also from Ricketts Pt. The anterior valve of the latter species has the insertion plate teeth commonly known as "Mermaids' Teeth".

Mrs. Z. Lee gave a short talk on a Nudibranch which she had observed in the act of laying eggs.

Mr. R. Condrón—two scarab beetles from Rushworth; also a species of dragon fly and saw fly.

Mrs. Z. Lee—a marine worm for identification taken at Sorrento.

Miss L. White—a species of bug.

Mr. K. Strong—silverfish scales under microscopic power.

Mr. D. McInnes—Amellid worms of different species. He gave a short talk on these, and described the feeding habits of one species—also an egg mass, possibly of a species of Sea Hare, taken at Sorrento.

Dr. B. Smith showed some colour transparencies of land snails and gave a short talk on them. He also showed some colour transparencies of a dredging trip for the collection of plankton undertaken by the C.S.I.R.O. last October at Morton Bay. Dr. Smith gave a running commentary on the methods of dredging used and the different types of apparatus employed.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.

Patron:

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MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available, and other activities are indicated in reports set out in the several preceding pages of this magazine.

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F.N.C.V. DIARY OF COMING EVENTS

GENERAL MEETINGS

Monday, 8 June—At National Herbarium, The Domain, South Yarra, commencing at 8 p.m.

1. Minutes, Reports, Announcements.
2. Nature Notes and Exhibits.
3. Subject for the evening—"Tide will Turn": Mr. E. G. Wallis.
4. New Members.

Ordinary:

Mr. J. Morley, 8 Mary Street, Hawthorn, 3122. (Interest—Geology.)

Mr. P. G. Smith, Botany School, University of Melbourne, Parkville, 3052. (Interest—Botany.)

Joint with Mrs. M. Corrick:

Mr. A. C. Corrick, Bank of N.S.W., P.O. Box 66, Moreland, Vic., 3058.

Country:

Miss Heather Maggs, 12 Allen Crescent, Stawell, Vic., 3380.

5. General Business.
6. Correspondence.

July—"A Biological Survey of Victoria": Mr. R. T. M. Pescott.

GROUP MEETINGS

(8 p.m. at National Herbarium unless otherwise stated)

Thursday, 11 June—Botany Group. Mr J. Baines will speak on the Botany of Captain Cook's Australian Voyages.

Wednesday, 17 June—Microscopical Group.

Friday, 26 June—Junior meeting at 8 p.m. at Hawthorn Town Hall

Wednesday, 1 July—Geology Group.

Thursday, 2 July—Mammal Survey Group meeting at 8 p.m. in the Arthur Rylah Research Centre for Environmental Studies—corner of Brown Street, and Stradbroke Avenue, Heidelberg.

Friday, 3 July—Junior meeting in Rechabite Hall, 281 High St., Preston at 8 p.m.

Monday, 6 July—Entomology and Marine Biology Group meeting at the National Museum in small room beside the theatre at 8 p.m.

Thursday, 9 July—Botany Group. Mr P. Kelly will speak on Moulds.

F.N.C.V. EXCURSIONS

Sunday, 14th June—Botany Group Excursion. Meet at Frankston Railway Station at 10.15 a.m. Anyone prepared to offer transport or desiring same please contact Mr H. Kleinecke (25 2415).

Sunday, 21 June—Natural Resources Conservation League Nursery at Springvale and visit to a Nature Reserve. The bus will leave Batman Avenue at 9.30 a.m. fare \$1.20. Bring one meal.

Saturday, 29 August — Sunday, 6 September—Wyperfeld National Park and Little Desert camp out. Tentative plan is to travel to Wyperfeld on Saturday, 29 August remaining there until Wednesday, 2 September then going to Broughton's Waterhole in the Little Desert for the remainder of the excursion. Members will be responsible for their own food and camping gear but there will be opportunities of replenishing food supplies during the week. The coach fare will be \$18.00 and this should be paid to the excursion secretary by the end of July, all cheques to be made out to Excursion Trust.

Saturday, Sunday 17-18 October—Weekend excursion to Castlemaine details later.

Geology Group Excursions

Sunday, 7 June—Maribyrnong River Terraces. Leader: Mr. Dan McInnes. (Previously advertised for 10 May.)

Sunday, 5 July—To Cave Hill (Lilydale) Limestone Quarry. Leader: Mr. J. Dobson.

Sunday, 9 August—To Heathcote. Leader: Mr. R. Davidson.

Transport is by private car (spare seats are usually available for those without their own transport). Excursions leave from the western end of Flinders Street Station, opposite the C.T.A. Building, at 9.30 a.m.

The Victorian Naturalist

Editor: G. M. Ward

Assistant Editor: E. King



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4 June, 1970

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Front Cover:

The enormity of size of the female of the *Nephila* sp., compared with that of the male, is shown clearly in this photograph taken by Graham Pizzey. (See article on p. 159).

Bushfire Frequency and Vegetational Change in South-eastern Australian Forests

By N. A. WAKEFIELD*

INTRODUCTION

The article deals primarily with certain forested Crown lands in the northern part of East Gippsland, Victoria. The area concerned is bounded by the Great Dividing Range on the west, the New South Wales border on the north, the Snowy River on the east, and a line approximately from the Little River-Snowy River confluence through Mount Seldom-seen on the south. The tract embraces some 250,000 acres, or a little over 400 square miles.

The elevation at the Snowy River is about 600 feet and at the Cobberas Mountains about 6,000 feet. The topography is complicated, with deep river valleys intersecting areas of mountain ranges and plateaus. Mean annual rainfall is from approximately 20 inches in the Suggan Buggan valley to over 40 inches about the Dividing Range. Due to variations in soil, precipitation, elevation and aspect, there is a mosaic of different vegetational formations. Of those in the tract which has been defined, the following will be commented upon in this article:

(a) *Peppermint Forests*. These occur mainly in the valleys of the Buchan River and its tributary the Reedy River. (The latter is called "Reedy Creek" on some maps.) They occupy more-or-less steep stony slopes on the warmer aspects, and the dominant trees are Broad-leaved Peppermint (*Eucalyptus dives*) and Brittle Gum (*E. mannifera*). In some places there is, in addition, some White Sallee (*E. pauciflora*) and/or Candlebark

Gum (*E. rubida*). The main grasses are *Danthonia* spp. (e.g. *D. pallida*), *Poa* spp. and *Themeda*, but grass is a minor element in comparison with the great bulk and variety of woody shrubs.

(b) *Gum Forests*. The Wulgulmerang Plateau, at about 3,000 to 4,000 feet elevation, and neighbouring areas, carries mixtures of White Sallee (*Eucalyptus pauciflora*), Candlebark Gum (*E. rubida*) and Mountain Gum (*E. dalrympleana*). In general there is a medium to thick ground cover of coarse grasses† (*Poa* spp., *Danthonia* spp. etc.), which intermix with sedges in flat wet places. On comparatively dry slopes, especially rocky ridges, there are some patches of shrubbery (*Pultenaea juniperina*, *Daviesia* spp., *Acacia dealbata* etc.).

(c) *Box Woodlands*. The lower parts of the valleys of the Snowy and Suggan Buggan Rivers, up to approximately 2,500 feet elevation, carry an open woodland of White Box (*Eucalyptus albens*) and fine grasses, mainly *Danthonia* spp., *Poa* spp. and *Stipa* spp.). On some of the northerly and westerly slopes the eucalypts are replaced by cypress-pine (*Callitris columellaris*); and steep more-or-less rocky hillsides carry Red Stringybark (*E. macrorrhyncha*) and coarser grass (mainly *Poa*).

* Monash Teachers' College, Clayton, Victoria.

† Despite the coincidence of genera, the actual species of grasses are generally different in the different forest formations discussed.

HISTORY OF CATTLE GRAZING AND BURNING

Cattle were first pastured in the Suggan Buggan valley in 1843, and from 1845 onward the Wulgulmerang area was used for grazing by members of the O'Rourke family. Soon after the turn of the century, properties at Black Mountain and Wulgulmerang were acquired by J. C. Rogers, and he and members of his family have grazed cattle, in the area defined in the above introduction, for the past 68 years. Usually the forest grazing involved about 300 to 500 Hereford cattle.

A general outline of burning practices and their effects on vegetation has been provided by K. C. Rogers, a grazier living in the Black Mountain area, in these terms (letter, 30/8/1969):

My father came to Black Mountain in 1902. In those days John O'Rourke of Wulgulmerang and others used to tell of the open, clean-bottomed, park-like state of the forests of this tableland and adjacent areas, which they could well remember from earlier days. The Pendergasts of Benambra, whose cattle runs adjoined ours at the Dividing Range, told the same story. Over a period of years, before we came to the district, it had been the accepted thing to burn the bush, to provide a new growth of shorter sweet feed for the cattle.

As soon as we boys were old enough, we were keen to do the burning. The practice was to burn the country as often as possible, which would be every three or four years according to conditions. One went burning in the hottest and driest weather in January and February, so that the fire would be as fierce as possible, and thus make a clean burn. As a general practice, in the valleys, we would light along the rivers and creeks, so that the fire would roar up the steep slopes on either side, making a terrific inferno and sweeping all before it. The hotter the fire, the sweeter and better the feed for the cattle after the new growth came. The tablelands received special attention, for the

high country, though more tedious to burn, provided the most feed. Should a wet summer occur, the burning programme was all the more important the following year.

In short, the run-holders, until regulations prevented, would consistently burn the bush as often as possible. The only area where this procedure did not apply extensively was the White Box country of the Snowy River and Suggan Buggan valleys, for the grass there was sweet without fire. It would seem that the long-followed practice of regularly burning the bush in the hot part of the year has resulted in a great increase of scrub in all timbered areas except the box country. The latter does not burn readily, even if fired, and the forests of White Box remain clean in the bottom.

That poses another question, regarding the great abundance of the younger group of cypress-pines in the valleys of both rivers, where there are only a scattered few of a much older generation of pines amongst the vast majority of the younger ones. In this case it is hard to credit that fire has been the cause of such an increase in pine population, since they are growing adjacent to, or in association with, the White Box timber. The stands of the younger pines were, to my knowledge, about the same in density and distribution 60 years ago as they are today, but I remember them first as much smaller trees.

During later discussion with Rogers, the following specific details were summarized with regard to vegetational growth after firing:

(a) *Peppermint Forests*

Fire cleared all minor vegetation and, when particularly severe in steep areas, it burned foliage and small branches completely off the trees. Within a few months *Eucalyptus dives* coppiced from the butts and on trunks and limbs. *E. mannifera* developed shoots on trunks and limbs but less at ground level. There was vigorous regrowth of ground vegetation, (mainly from root stocks) comprising shrubs, herbs and an abundance of grass of many species (including some annuals). Seeds of shrubs, especially *Olearia*, *Cassinia* and *Heli-*

chrysum, germinated, as well as those of most eucalypts. *E. rubida*, when present, germinated very prolifically in areas of fierce fire. After years of firing, *E. dives* formed dense thickets due to its ability to coppice after fire. Almost impenetrable peppermint scrubs have become quite a feature along ridge tops of the steep Buchan River valley.

Grass was most palatable to cattle during the season (spring and summer) following a fire. *Danthonia pal-lida*, for instance, provided good grazing at first but leaves hardened after 18 months (hence the local name "wire grass").

By 3 years, shrubbery had matured and ceased growth, grass coverage was smothered and reduced in bulk, and the eucalypt scrub was about 7 or 8 feet high. At this stage, the area was reburnt. (Burning was rotated, so that a third or more of the forest was burnt each summer when conditions permitted).

(b) Gum Forests

In general, an area would be burned over about every four years, but some parts, for example those adjacent to the Black Mountain properties, were generally burned at 3-yearly intervals. Fires were usually not fierce, but occasional fierce bursts occurred, especially on the rougher terrain. Grass was burned back, shrubs and eucalypt scrub killed to ground level, and wattle scrub often killed completely. By the following spring there was regrowth of grass and shrubbery from the rootstocks, eucalypts had coppiced, and seedlings of eucalypts and wattles had appeared. Eucalypt germination, especially of *E. rubida*, produced dense crops in areas of fierce burns. In some areas *Acacia dealbata* formed dense scrubs after fires.

Grass remained palatable and con-

tinued to grow through the second spring-summer season also, but after two years showed little or no further increase in bulk. The *pauci-flora-rubida-dalrympleana* association was, and still is, on the average, much more grassy and less scrubby than the *dives-mannifera* association.

The escarpment which faces southerly on the northern side of the Reedy River valley provides a conspicuous example of the development of scrublands as a result of firing. Originally there was a well-grassed clean-bottomed forest, mainly of *Eucalyptus dalrympleana* but with some *E. rubida*. It is now an area of dense scrub.

(c) Box Woodlands

In general, the country is not susceptible to fire. Lightning fires seldom travel far, except in steep country. During the past 60 years, no fire has burned down into the more open and level parts of the Suggan Buggan valley, not even the fiercest ones that have swept the surrounding forests.

No attempts were made to fire the open Box Woodlands, but some burning was done on the rougher slopes of *Eucalyptus macrorrhyncha*, on adjacent steep slopes of *E. albens*, in rough creek heads, etc. Such burning generally resulted in marked development of scrub (*Eucalyptus*, *Helichrysum conditum*, *Cassinia* spp. etc.), and any further burning that was done tended to increase this shrubbery.

FERAL AND NATIVE MAMMALS

Rabbits

In the latter part of last century, the O'Rourkes used to run several hundred head of cattle, mainly in the Box Woodland areas of the Suggan Buggan and Snowy River valleys. Rabbits appeared in the country about

the turn of the century and quickly reached plague proportions. Hares were numerous up to that time but then disappeared within a few years to the level of extreme rarity. The development of scrub had progressed in the forests (as distinct from the Box Woodlands) before the rabbit came, but not to the extent that it has during the present century.

Rabbits did not become abundant enough in the forest areas to have significant effects on the vegetation, but in the Box Woodlands they became very numerous and more-or-less denuded the ground of herbage. The stock-carrying capacity of the woodlands was decreased to about one-tenth its earlier level.

In 1948, the writer noted that, although numerous tiny seedlings of *Callitris* could be found in the Suggan Buggan area, there were no specimens whatever between that stage and the small trees estimated at about 50 years of age. Since the advent of myxomatosis, in 1952, and the resultant reduction of the rabbit population, there has been a significant survival of *Callitris* seedlings and many of the young plants are now some feet in height. The conclusion is that *Callitris* germinates freely without fire but that subsequent survival and growth is contingent upon lightness or absence of grazing. According to ring counts and measurements of girth, the scattered specimens of old *Callitris* trees range in age from about 100 to 250 years.

Following reduction of the rabbit population, grass growth has increased again in the Box Woodlands.

Wild Horses

These have usually been present in some hundreds in the area under discussion. They are highly mobile and more nomadic than cattle, and move in force on to recently burned

areas, to eat the new grass growth. They crop the herbage closer than cattle do, and thus can feed on shorter and sweeter grass, such as much of that on the subalpine meadows. In summer they concentrate on the snow grass on the high mountains, whereas cattle usually graze there only after it has been burned, and that is very rarely.

Kangaroos and Wallabies

The Grey Kangaroo (*Macropus giganteus*) is scattered but uncommon in the *dives-mannifera* association; it is more numerous on the plateaus in the Gum Forests. Originally, kangaroos were rare on the higher plateaus but are now not uncommon at 4,000 feet and higher. They are plentiful on the fringes of cleared paddocks, which they enter at night to graze on the improved pastures. In the Box Woodlands their numbers have varied in inverse proportion to those of the rabbit populations.

The Brush Wallaby (*Macropus rufogriseus*) appears to be more numerous now than it was originally. It favours drier slopes of the *dives-mannifera* association (living in eucalypt and *Daviesia* thickets) and the more scrubby Gum Forests of the lower plateau country.

DISCUSSION

The writer, while living and working in various East Gippsland localities from the 1920s to the early 1950s, has been acquainted with the practices of graziers in the region and has made both general and particular observations of the vegetation. The history of very frequent firing of forest areas and the change from comparatively open formations to more scrubby vegetation, as described by Rogers, has applied in general to the dry sclerophyll forests throughout

East Gippsland. Various other species of eucalypts have been involved, but patterns have been similar. There is evidence also that development of scrubby forests in south-eastern New South Wales and in other parts of Victoria has been associated with high frequency of bushfires.

Graziers' fire practices in New South Wales, over 140 years ago, are described by P. Cunningham (*Two Years in New South Wales*, vol. 1, pp. 211-2; 1827):

The old withered grasses are usually burnt off in the spring, and often at other periods of the year if you have an extensive run for your stock; and it is astonishing to see how quickly and how luxuriantly the new grass will push up after these burnings, if a shower of rain should happen to follow them. When judiciously accomplished, they certainly produce most beneficial effects, by destroying all the old grass which the cattle and sheep refuse to eat, and which is therefore only a bar to their feeding.

The last sentence of the quote conforms to the parts of Rogers' data which note that in the forest areas over-mature grass is not readily eaten by stock. In this connection it is relevant that virtually all the more open forests in south-eastern Australia were included in the runs leased to the original squatters, and that, subsequent to that era, most of the forests were again leased more-or-less continuously to graziers. Consistent rotational burning was necessary in these grazing leases to keep them functional from the graziers' point of view.

There has been much consideration recently, by foresters and other interested persons, of the problem of fuel accumulation in southern Australian forests, and of the question of the use of mild burning, in suitable weather conditions, to reduce this fuel and thus minimize the risk

of very destructive wild fires in the forests concerned. When endeavouring to establish an historical background to the problem, authors of addresses and documents on the subject usually advance the hypothesis that the widespread change from open grassy forests to dense scrubby formations has been due to *infrequency* of fires during the era of European settlement in Australia, as compared with the (postulated) high frequency of aboriginal fires. As far as sclerophyll forests are concerned, such histories as that given by Rogers indicate that this hypothesis is the opposite of actual fact.

As regards East Gippsland, and evidently elsewhere in south-eastern Australia, the salient points are (i) that for about a hundred years there was a regime of rotational burning, at 3-4 year intervals, of many or most areas of dry sclerophyll forest, and (ii) that during this regime there was marked increase in shrubby undergrowth in these forests. It is significant that such evolution of scrub occurred in areas subjected to maximum possible fire frequency. This appears to demonstrate, conclusively, that the more grassy and less scrubby forests known to the earliest settlers were *not* a deflected climax due to high fire frequency but were, on the contrary, a state of vegetation associated with comparatively low fire frequency.

It should be noted that these comments are applied to dry sclerophyll forest formations, not to woodlands or wet sclerophyll forests. The main areas of Box Woodlands of north-eastern Gippsland have not had a known fire history nor have they been involved in the problem of accumulation of scrub and other dangerous fuels. The wet sclerophyll forests of Victoria, notably those dominated by *Eucalyptus regnans*, have

had quite different histories — in this case involving comparatively infrequent but very devastating fires.

It should be noted also that, in general, the regime of high fire frequency in the dry sclerophyll forests of Victoria terminated some 20 years or more ago, with the introduction of certain legislation, the implementation of stricter fire prevention measures, and the development of more sophisticated access and fire fighting facilities. During the past two decades, over-mature scrub and dead fuel have tended to accumulate, and there have been some very destructive accidental wild fires, such as those which swept the Wulgulmerang area and neighbouring parts in 1952 and 1965. It is this kind of episode which necessitates the consideration of

systematic fuel reduction by controlled burning.

The point which this article seeks to emphasise, that the increase of scrubby undergrowth in our dry sclerophyll forests was associated with *high* fire frequency, is of academic rather than practical importance. The forester's practical problem is to determine how to reduce the inflammability of the present scrublands, irrespective of the factors which caused their development. The matter of cause however has bearing on the question of aborigines' use of fire and the frequencies of fires in various formations in Australia in the pre-colonization era. It is proposed to consider these latter aspects in a further article on bushfires in the near future.

APPENDIX

A draft of the foregoing article was submitted for criticism to certain persons who are actively concerned with problems of forest fires, and those persons made the following suggestions:

(a) That the burning carried out on the Rogers run had *not* in fact been as frequent as stated, that fires burning in 3-year-old fuels would *not* "roar up the steep slopes", etc., and that such effects would have been observed instead in fuels not burned for probably six years or longer.

(b) That, while mild fires at 4-year intervals (and in some places longer) would be likely to change a clear forest floor into a scrubby one, this did not negate the theory that many "clear" forests of the dry sclerophyll types were due to more frequent fires.

(c) That if two, three or even four fires occurred in quick succession on an area, then those shrub species not able to survive by root stock or seed supply would be substantially reduced and it would take many years for them to recolonize the area, regardless of fire frequency after the "quick" fires.

After examination of these criticisms and comments, Rogers replied as follows (letter, 10/11/1969):

I can only stress the accuracy of the statement that we burned the bush *as often as possible*. Naturally there were seasons when burning could not be done, so that there were instances when certain areas missed out on a burn for six years or more. These naturally were the places that carried the greatest infernos if in steep country, and such fierce fires tended to produce the worst scrub. On the other hand, we burned a lot of the bush every three years.

No bushland in this area would ever burn extensively if fuel were only one or two years old. A vivid example of this was in the great 1939 fire which, after burning Omeo, raced on eastward on Black Friday as far as the high exposed ridge known as Fish Creek Top. There the fire was intense and the branches were burned off the trees, whilst in the Fish Creek valley, immediately below and on the east side, we later observed that burning air-borne debris had started numerous small spot fires which had then gone out. We had burned out that valley and most of the area eastward to this property two years previously, thus saving our home area from the blaze despite the terrible conditions that day.

At three years, if conditions favoured in January and February, fire would sweep over certain areas such as the Buchan River valley at quite a pace, owing to the quantity of dry grass with the scrub. We would also burn a lot of the tableland area, of 3000 to 3500 feet elevation, which surrounds our property, every third year, though this gum forest country is less burnable than the peppermint slopes. Indeed, one summer a number of years ago, during a heat wave, the whole of the tableland along and southward of the Rocky Range, and embracing the heads of Omeo Creek, carried a spectacular fire several miles in extent and severe enough to kill the forest of *E. dalrympleana* and *E. pauciflora*. I can vouch for the fact that the same area was all burned three years previously. However, the top shade temperature that day was 98°, which is quite exceptional for this altitude, and there was a high north-westerly wind with it.

It will be seen from the above details that we indeed carried out "saturation burning", if that term means burning as frequently as possible. It is also evident to me, from results observed, that burning every three years still produces scrub. Most young eucalypt seedlings sprout from the stock when the top is killed by fire. There is also an inexhaustible supply of seed in the ground, which is helped by fire to germinate from burn to burn. This seems to apply to nearly all native plants. That is why scrub now infests the forest floor throughout the tablelands and gorges.

The criticisms and Rogers' further comments, which comprise the foregoing part of this appendix, appear to confirm the earlier contention that, in general, a regime of maximum fire frequency was maintained in the forests in question and that this regime progressively increased the scrubbyness of the forests. This leaves unchanged the conclusion that fires due to lightning and aborigines were collectively less frequent than those during the era of colonization.

As regards the hypothesis that scrub may be eliminated by very frequent fires, it should be noted that *Cassinia*, *Helichrysum* and *Olearia* species flower and produce their first crop of seeds from 24 to 30 months after germination, and that large shrubby fireweeds (*Senecio* spp.) seed at 12 to 18 months. Therefore, if fires are to eliminate these species by preventing them from seeding, the habitats would need to be burned regularly at 2-year intervals in the case of the first group, and annually in the case of *Senecio*. A regular 2-year fire frequency is certainly not possible in East Gippsland forests and is probably not possible in any of our dry sclerophyll forests.

Rogers' inference that the supply of seeds in the ground does not become exhausted despite a series of germinations, is evidently quite valid. In various parts of Victoria it has been noted that areas which have been bare of shrubs for decades, because sheep and rabbits have eaten all seedlings which have been growing over the years, will produce a cover of native shrubbery when those grazing animals are excluded.

A Spider and Its Mate

A ROADSIDE ENCOUNTER

by MADGE LESTER

In March 1969, en route to Seymour via the Hume highway, I stopped for a leg-stretch somewhere the other side of the "Divide". Wandering near the road, I came upon a huge spider in a huge web. The spider was at about head height over a gully-cum-drain, and the web was supported from bushes about 8 feet apart.

Never before had I seen such a big spider: a gross, bloated thing, the abdomen being about 1" long, but quite an attractive pale grey colour; while the legs were black and white with touches of yellow. Trussed up in the web above the spider was a substantial collection of queer rubbish, presumably the remains of past meals.

I returned to the car for the camera, put it on a tripod and added a ring to the lens with the idea of shooting at about 10" distance. I was trying to splay the legs of the tripod to get it steady, when the spider suddenly raced across the top of its web. I do not like spiders at any time, and when one the size of a plum becomes very active a few inches from my face, my natural reaction is a sharp withdrawal. Anyway, I could not get the tripod steady so thought I would try round the other side.

By the time I had walked round the bushes the creature had settled down again. But it was even more revolting from this side, for there was a big hole—about the size of a match-head in the body, and this side was not the pleasant grey colour of the back. I was struggling with the tripod when I saw something that prevented all further attempts to spread the tripod

legs and thereafter I used them together as a single long pin.

Coming down through the remains of past meals was a little rusty-red thing. It was the size of a large pea and had very long legs.

My total knowledge of spiders was that they make webs, have eight legs, and the male is usually smaller than the female — but I never dreamt there could be so much difference in size as this. But surely nothing but a male of the same species would be so foolhardy as to choose to approach such a monster.

The little rusty-red spider came on hesitantly. Accidentally I shook the web and it raced back. But it did not go far, and again advanced downwards.

Having now arrived at the hole in the monsters body, he poked his "feelers" into it (*palps* is the correct term for those). This took some seconds, but all the time the female was entirely motionless as if in a trance.

After he had completed this act, instead of going back up the way he had come, the silly little thing continued on down forwards. He came on cautiously — advancing, pausing, and retreating, similar to but even more cautious than in its earlier approach to the hind end. He looked just as compulsive.

It seemed to me that there could be only one outcome, and I was torn between not wanting to see it and wanting to see everything possible. I stood rooted, ready to shoot as soon as the female moved. But nothing

happened; whilst the little fellow continued to advance and retreat. Then I realised that I was running late for the appointed lunch, so hastily grabbed everything and dashed off. I therefore do not know the final outcome!

* * * *

These observations made me realise how appallingly ignorant I was, and I began to seek information on spiders. I can thoroughly recommend the book in our FNCV library *The World of Spiders* by W. S. Bristowe. Bristowe is not merely interested in spiders, he has not merely studied them intensely, he *loves* spiders. But Bristowe's spiders are English. We have nothing so loving or so detailed on Australian spiders. Perhaps Stann-ton's book is a reasonably adequate introduction. The 96 pages he grandly calls *All about spiders*. He has just one page on *Nephila*, so my information of that genus has been gathered elsewhere — from McKeown's *Spider Wonders of Australia* in the library and other sources not in the library.

This large spider is a *Nephila*, a genus that occurs throughout Australia. There are about seven Australian species.

Some *Nephila* species have been called bird-snaring spiders, but although McKeown gives evidence of small or young birds occasionally being killed by a *Nephila*, the main food consists of large moths, beetles and crickets. Spiders feed on the juices of their prey, and as *Nephila* does not remove her web each morning as some spiders do, she seems to find the web a convenient parking place for the husks of her victims.

Nephila is also called the Golden Web Spider; the main web being pale yellow, sticky and shining, whilst the strut threads and some in the orb too

are whitish — differences I failed to observe.

The mating of spiders is certainly peculiar. A few days after its final moult, the male spider builds a tiny web only a few millimetres across on which it secretes some sperm; or, according to the species, the ground, a stick, or a leaf might serve instead of the tiny web. I do not know what *Nephila* does.

The male then transfers the sperm into its palps, and goes seeking a mate. The palps work something like a fountain-pen filler.

The difference in size of male and female is not usually so great as in *Nephila*. The male might be only a little smaller than the female. Nevertheless, mating can be a hazardous business for him and there is usually some sort of courting approach, varying according to the species. With *Nephila*, this seems to be approach cautiously and run back, approach and run back, until the female has wearied of chasing him away and is ready to receive him.

When I first tried to fix the tripod to photograph the back of the female and it suddenly dashed across the top of its web, was it chasing out the male?

That is what I suspect from what I have since read, but I did not see the male until some time after I had moved round to the other side. If only I had known then what I know now I might have observed so much more.

Also, some books speak of *Nephila* hanging in the web during the day with the body down, and two photos show the body down position. When I first saw this one, was she hanging body down or head down as in the accompanying photo*. I do not know; and that is very careless observation. One assumes that the head down is a mating position, but is that position

*See Cover.

taken only when ready for mating; and is thus recognised by the male as comparatively safe?

My sources of information do not make that suggestion and it would seem that more observation is required.

McKeown says that the male *Nephila* usually lands first on the back of the female, and Graham Pizzey has a photo of one there*. But in my observations the male came straight down the front. The male empties its palps into the female body. Bristowe meticulously records whether the two palps are inserted together or one at a time, and whether in one or more actions, as well as the time it takes.

I neglected to observe all these factors. But I can make a guess at the time. There was time enough to wind

*See Cover.

on the film, swing camera slightly and re-focus, so I assume it was not less than 10 seconds and, from recollection, not more than 60. But that's a pretty wide margin. Graham Pizzey records the process in a *Nephila* he observed as taking about six seconds, and the female grabbing the male as soon as it was over.

But there were many things I neglected to register and I feel very annoyed that a good opportunity was largely wasted. Of course, some of it was due to colossal ignorance — not knowing what to look for or what to expect; but it was mainly due to observation that was far too casual. We need careful, attentive observation — observation that could help to fill in the gaps that still exist in the knowledge of our Australian creatures.

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The Freame Marine Collection

It may be of some interest to those members who knew the late Mrs. M. E. Freame of Altona, to learn that her collection of marine specimens has been purchased by the Rosebud Aquarium and Museum.

Showcases will shortly be made for its reception. It is expected that it will be on public exhibition later in the year.

The Mitchell River Silt Jetties

by E. C. F. BIRD*

The origin of the silt jetties built by the Mitchell River below Bairnsdale (Fig. 1) is still controversial. In 1874, Skene and Smyth suggested that they developed in the manner of a digitate delta, originating when the mouth of the Mitchell opened into Lake King at Bairnsdale, and growing first southwards to Eagle Point, then east-north-eastwards to project into Lake King. This hypothesis was generally accepted (e.g., Gregory, 1903), but in 1949 Clifford wrote an article in the *Victorian Naturalist* suggesting that the silt jetties were produced by partial submergence of a broad flood plain that had been previously built by the Mitchell, with natural levees bordering the river channel, and that below Eagle Point the backswamp depressions flanking these natural levees were submerged to form Jones Bay on the north and Eagle Point Bay to the south. In 1962, after investigating the geomorphology of the Gippsland Lakes, the present author found evidence in favour of the earlier hypothesis of progressive growth of the Mitchell River silt jetties, but this has been questioned by Jenkin (1968) in a memoir published by the Mines Department, and further discussion is now necessary.

In 1962 sand and gravel features were reported along the base of the bluffs west of McLeod's Morass (Fig. 1) and interpreted as shoreline features indicating that Lake King extended to the base of the bordering bluffs prior to the construction of the

Mitchell River silt jetties. It was deduced that the Mitchell had built these jetties in such a way as to cut off this western shoreline; the Skene and Smyth hypothesis of progressive growth was therefore preferred to Clifford's hypothesis, which required that natural levees were already present when the last submergence took place.

Jenkin (1968, p. 56) rejects the view that the sand and gravel deposit west of McLeod's Morass is a shoreline feature (i.e., a beach) and describes it as a narrow flat terrace consisting of outwash material from the bordering bluffs. Sand and gravel *downwash* (a term preferred to outwash, which in geomorphological literature is usually applied to material derived from glaciers and ice sheets) has certainly contributed to this slope-foot depositional feature (Fig. 2), but the fact that this feature also extends as a ridge across the mouth of a tributary valley (Fig. 3) and, farther north, projects as a slightly recurved spit, means that some other process has been involved in distributing the downwashed sand and gravel. Jenkin comments that the presence of coarse material (up to cobble size) relative to the available easterly fetch is not consistent with the view that this ridge is a wave-built feature (i.e. a beach ridge), and suggests the possibility of emplacement by river action.

This reasoning cannot be accepted. The available easterly fetch here was at least five miles, and there are several sectors of the present shoreline of Lake King where beach shingle, in-

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cluding cobbles, exists with a much smaller fetch than this: on the north shore of Jones Bay (Fig. 1) for example. The critical factor is the availability on these sectors of the lake shore of coarse material (up to cobble size) for incorporation in beach deposits. This coarse material has come from gravel-capped Tertiary rocks in cliffed sectors of the bordering bluffs. It has certainly not come from the Mitchell River, which carries a load of silt, clay and a little sand, and has built bordering natural levees of this material. The coarse sand and gravel deposits forming the ridge west of McLeod's Morass are similar in texture and composition to existing beaches on the shores of Lake King, and sharply contrasted with the predominantly silty material in the Mitchell River levees, as shown by sedi-

mentological evidence in Fig. 4. The ridge west of McLeod's Morass is therefore not a river levee but a beach formation that extends northwards as a spit which has grown in the opposite direction to the southward flow of the Mitchell River.

As Jenkin remarks, deposition of this sand and gravel material west of McLeod's Morass took place when the water level was at least five feet higher than at present; it is one of several features in the Gippsland Lakes area suggestive of a phase of higher sea level, relative to the land area, during Recent (Holocene) times. Jenkin supports the concept of a mid-Recent sea level 7 to 10 feet above the present, and if this is accepted in local and relative terms (without reference to the controversy over Late Quaternary world-wide sea level

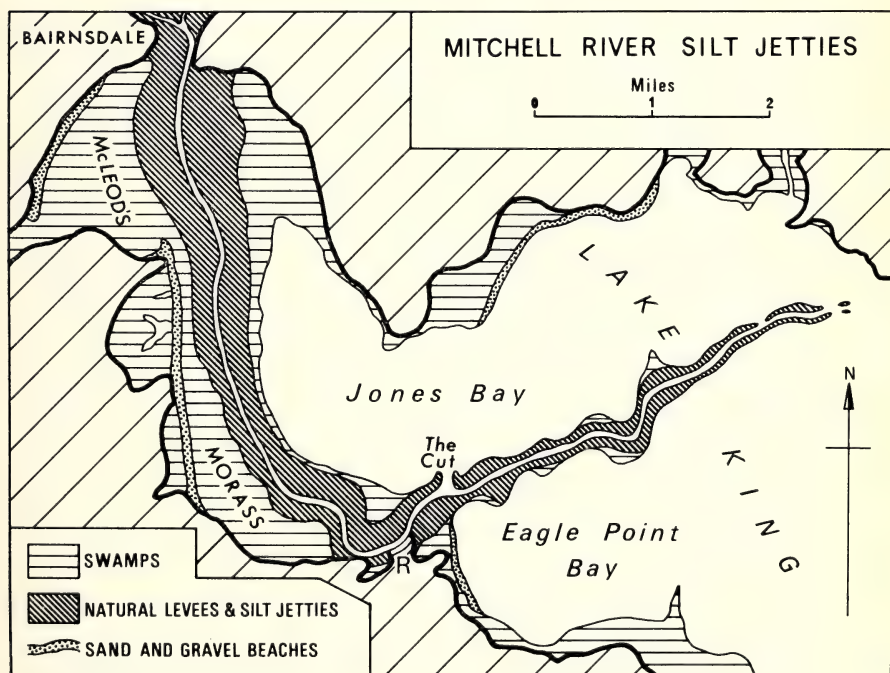


Fig. 1.



Fig. 2. The slope-foot terrace feature west of McLeod's Morass.

fluctuations) the emplacement of the wave-built features west of McLeod's Morass is simply explained. Yet Jenkin then proceeds to revive Clifford's view that the silt jetties are partially submerged natural levees protruding from a drowned flood-plain.

There seems to be a contradiction here. If the last change of level has been one of emergence from a mid-Recent higher sea level, it is difficult to sustain Clifford's hypothesis. The silt jetties do not rise more than 10 feet above present mean lake level,



Fig. 3. The beach ridge (arrowed) west of McLeod's Morass, an extension of the slope-foot terrace feature shown in Fig. 3.



and if they already existed in mid-Recent times they must then have been almost completely submerged. As they are delicate features, being rapidly consumed by wave erosion at the present time, it is unlikely that they could have survived such a submergence. If they had, it would be necessary to consider the present silt jetties as features produced by partial emergence, rather than partial submergence. But it is much more likely that they developed by progressive growth during, and especially since, mid-Recent times.

The difference between the building of natural levees by vertical accretion adjacent to a river channel and the prolongation of silt jetties by forward accretion adjacent to a river mouth is a subtle one. Clearly both processes have been at work, but there is no way of distinguishing them, or deciding which operated first, in terms of sedimentological or stratigraphic evidence; there is little variation, laterally or vertically, within the silt jetties.

However, borings in the silt jetties downstream from Eagle Point show that the silt formation is a superficial feature, resting upon a broad and deep expanse of blue clay of estuarine or lacustrine origin. At the Mathieson water-pump, on the northern jetty 250 yards east from The Cut, silt extended to a depth of 6 feet below mean lake level, where it was underlain by 80 feet of dark blue soft clay, resting on gravels, with Tertiary limestone at a depth of 105 feet. The sequence at Letts Bore, farther downstream on the southern jetty, was almost identical*, and the presence of the underlying clay has been confirmed by augering along the lower delta. The clay is similar to lake-floor sediment in Jones Bay and Eagle Point Bay, and is interpreted as material deposited on the lake floor before the silt jetties grew out over it into Lake King. If the silt jetties had originated as natural levees on an aggraded valley

* I am indebted to Mr. M. Hobson of Lakes Entrance for details of these borings.



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floor plain they would instead be underlain by a more varied sequence of alluvial deposits. The stratigraphic evidence therefore favours the hypothesis of progressive growth of the Mitchell River silt jetties.

Clifford (1949) indicated two features that he found difficult to reconcile with the hypothesis of progressive growth. He noted that the meanders between the silt jetties are not reflected in the configuration of their outer (lake) shorelines, and he argued that a growing delta, deflected by Eagle Point Bluff, should have taken the direction of the breach

cut through the northern arm of the silt jetties immediately downstream by a flood in 1919.

It is likely that initially the river channel between silt jetties growing out into Lake King would have been fairly straight, but there is nothing to prevent the subsequent development of meanders in the delta tract and no reason why such meandering should influence the configuration of the outer shoreline. The Mitchell channel downstream from Eagle Point shows meanders of a type similar to those of the modern digitate delta of the Mississippi, where successive surveys

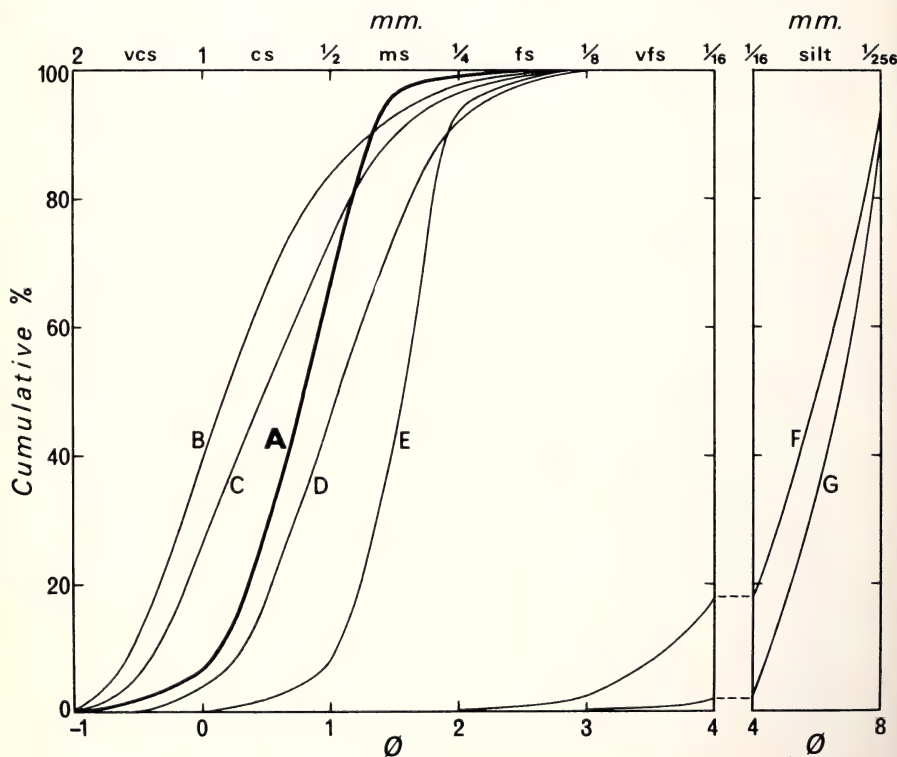


Fig. 4. Grain-size distribution curves of the sand fractions of (A) material from the ridge west of McLeod's Morass and (B-E) beaches from the shores of Lake King. The original samples included the following percentages of material coarser than 2 mm. (granules, pebbles, and cobbles): A—41.5%, B—44.3%, C—28.5%, D—34.0%, E—23.8%. Sediments A-E are contrasted with the much finer material from the natural levees and silt jetties of the Mitchell River (F, G).

show that channel meandering developed in Pass a Loutre and along South-east Pass within the period 1869-1940 (Fisk et al., 1954; Shepard 1955). The Mitchell at Eagle Point has continued to meander over a similar period, undercutting the river cliff (R on Fig. 1) and, a short distance downstream, migrating northward to reduce the width of the northern jetty until it was breached (a process known as crevassing in the Mississippi delta) by a discharging flood (Fig. 5). Meandering since the original formation of the silt jetties has thus prepared the way for a new direction of delta growth, and a small delta has been built at The Cut, projecting into Jones Bay. The features noted by Clifford are thus explicable, and are consistent with the hypothesis of progressive growth of the Mitchell River silt jetties.

At the present time these silt jetties are being destroyed by wave attack

on their lake shores, and the conditions under which they formed no longer exist. It has been argued that the growth of long, narrow silt jetties out into Lake King was made possible by the presence of shoreline reedswamp (chiefly *Phragmites communis*), which trapped fluvial sediment and protected the depositional features thus formed (Bird 1961). Lake King has become too brackish, following the cutting of an artificial entrance in 1889, for reedswamp to flourish on its shores, and shoreline erosion has become widespread since the disappearance of this vegetation. If the Gippsland Lakes were returned to their earlier relatively fresh condition it is likely that reedswamp would revive and the process of silt jetty growth would again be demonstrable. Failing this, the process can still be observed thirty miles away in Lake Wellington, where the water is less saline than in Lake King, and



Fig. 5. The Cut, a breach formed in the silt jetty by a discharging flood.

where silt jetties are growing with the aid of bordering reedswamp at the mouth of the Latrobe River.

Acknowledgement: I am grateful to N. Rosengren for help with photographic work and to H. Collier for preparing diagrams.

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A Subalpine Occurrence of the Common Mud-mat

(*Glossostigma drummondii*)

This minute hairless herb of the family *Scrophulariaceae* creeps and roots on damp mud, forming moss-like carpets. Interest centres in its three large blunt calyx-lobes and especially in the curious stigma which is flattened and almost leaf-like, arching over the four microscopic stamens. *Glossostigma drummondii* occurs through inland areas of all mainland States but has never yet been reported from mountainous terrain along the Great Dividing Range, although it does inhabit the margins of temporary rock pools on the arid hills of Central Australia, e.g. at the summit of Ayers Rock. Victorian records were all from the Mallee or Wimmera (an ephemeral population with flowers on slender stalks exceed-

ing the foliage); so an undoubted collection, albeit with relatively shorter flower-stalks, by Mr. Keith C. Rogers in the region of Forlorn Hope Plain, 27 January, 1970, is quite important ecologically. He found *G. drummondii* growing intermingled with diminutive *Crassula helmsii*, *Myriophyllum pedunculatum*, *Oreomyrrhis ciliata* and *Limosella australis* on sods of wet black peaty mud, at about 4,000 ft. altitude — a noteworthy addition to Mr. Rogers's long list of botanical discoveries in East Gippsland. For a general floristic account of this fascinating area, see "Forlorn Hope and Reedy River", by N. A. Wakefield, in *Victorian Naturalist* 77:4-11 (May 1960).

J. H. WILLIS

Plans for a Proposed Census of Non-Marine Molluscs in Victoria

by BRIAN J. SMITH*

and

DAVID C. LAND

This short article is intended to let the numerous active field naturalists in Victoria know of the proposal to commence a census of non-marine molluscs of Victoria and enlist the help of any willing person. The object of this census is not only to produce detailed distribution maps of all the non-marine molluscs in the State, but also to carry out taxonomic revisions of these various groups and subsequently to publish a handbook of Victorian non-marine molluscs.

Coupled with these main objectives, other interesting information will emerge from such a survey—

(a) The exact distribution of the introduced snails and slugs (mostly pests).

(b) The present distributions of the Australian native species compared to their known past distributions, as an indicator of the effects of increased land utilization, and other factors.

(c) Distribution of the freshwater snails which act as intermediate hosts in the sheep liver fluke life cycle.

(d) Detailed data of distributions of land and water populations as a basis for future pollution monitoring. This applies particularly to freshwater molluscs.

This survey is being modelled on a similar one being carried out in Great Britain and Ireland by the Conchological Society of Great Britain. One of us (D.C.L.) has practical experience of this survey in Britain and we have been promised help and advice by that Society. For the history of the U.K. survey see Kerney (1967).

*Curator of Invertebrates,
National Museum of Victoria.

Collecting.

It is hoped that as many people as possible will collect and send specimens to the National Museum of Victoria for identification and to allow taxonomic work to be carried out. However it is hoped that local collectors or group co-ordinators can be recruited from the various regions of the State to learn the methods of identification.

Following a recording scheme devised for a botanical survey by workers at Monash University, the State will be divided into 34 squares of side 1 degree of latitude and longitude. These large squares will be divided into the census record squares each of 10 minutes side—equivalent to 11.5 miles by 9.2 miles on the ground. This is a more suitable method of gridding than by using topographical features; for rivers can be dammed, mountains quarried away, and so on, whereas latitude and longitude can always be relocated.

Every part of the State should be visited more than once, and a systematic search made of every habitat. For land snails and slugs, which are usually (especially in daylight) retiring, cryptic animals, always look under objects such as logs, rubbish, or covers of storm-drains—anywhere where it is likely to be dark and damp. Look in gardens, rubbish dumps, deep forest litter, scrub and heath country and coastal dunes. Be especially watchful for the small snails (endodontids) of 1mm diameter. These can be found most easily by collecting a bag of litter or other debris and searching it carefully at home with a magnifier. For aquatic molluscs, look on the

undersides of floating weeds for snails, on the stems and leaves of water plants for freshwater limpets and in the mud at the bottom of streams and rivers for bivalves. A very useful freshwater collecting tool can be improvised by attaching a 6" diam. gravity strainer to a broom handle.

Preservation and Transport.

As stated above it is initially planned that specimens should be sent to the National Museum of Victoria for identification and recording. For this it is probably best to send the specimens alive. Put the specimens from each locality into a non-crushable container in damp grass or leaf litter, pack this container well into a parcel, mark the parcel SCIENTIFIC SPECIMENS and mail it to—Dr. B. J. Smith, Curator of Invertebrates, National Museum of Victoria, Russell Street, Melbourne 3000.

Freshwater molluscs (snails and mussels) can be sent in the same way. **Do not** send freshwater molluscs in water as they die and rot very quickly. Do not put the locality label in the container with the live snails as they will probably eat it. Do not include green vegetable matter with live specimens. Attach the label to the outside of the inner container or put it inside in a plastic bag or other protective cover. Put in as much field data as possible.

If it is impossible or impracticable to send the material live then it should be narcotized and preserved before sending. Land snails and slugs are narcotized by drowning in freshwater. To assist this break a cigarette into a tumbler full of water and immerse the snails in this mixture for a few hours. Preferably preserve in 5% formalin neutralized with sodium carbonate or baking soda, or in 70% alcohol or methylated spirits. Put freshwater snails into a small container of water and gently stir in a few crystals of Menthol. Leave for a few hours, then preserve as for land snails. Prop the valves of mussels open by inserting matchsticks and then preserve as above. Put a label with the specimens, wrap them in cotton wool moistened with the preservative, seal in plastic bags, pack securely in a parcel and mail.

Helpers and Groups.

If you feel that you can help in this work either as a collector, or (if you live in the Melbourne area) as a data collector and recorder, please contact the National Museum of Victoria.

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* * * *

Arion intermedius Normand, an Introduced Slug in Victoria

by David C. Long

Introduced European slugs have been known from Victoria for a considerable time (early references are given in Gabriel 1930:86), but only members of the family Limacidae have so far been recorded as established. The purpose of this note is to

record the presence of *Arion intermedius* Normand of the family Arionidae as an established introduction in Victoria. In the field *Arion* can be distinguished from Limacid slugs by the more anteriorly placed respiratory pore on the right margin of the

mantle shield, the granular nature of the mantle shield (not concentrically ringed as in *Limax* and *Agriolimax*), the wide foot-fringe and the lack of a caudal keel.

A. intermedius is small, "about 2cm when crawling. Its colour varies from yellow to grey with the head darker grey or black and there may or may not be body and mantle bands. All these colour varieties may be found living together. *A. intermedius* is easily distinguished from the young of larger species by the form of the dorsal tubercles which stand up in little conical eminences with translucent tips when the animal contracts (Fig. 1b)—hence the popular name Hedgehog Slug. . . . The sole is yellowish-grey and yellow mucus tends to accumulate at each end of it." (Quick 1961:125). In Europe it ranges from Scandinavia to the Azores, Northern Italy and Russia and has been introduced into North America, Polynesia and New Zealand. Longstaff (1912:448) records it from wild bush in New Zealand associated with the introduced snail *Oxychilus cellarius* (Müller).

In Victoria *A. intermedius* has been found in the following localities:—

Beaconsfield and Berwick—340312 (Grid reference using the 10,000 yard traverse Mercator Grid, Zone 7—Australia Series)—5.x.1969. Fairly common under rotting logs and branches in partially cleared pasture (open eucalypt forest with grassy ground layer) near Cardinia Creek.

Badger Creek—357352—30.x.1969. From wet eucalypt forest under fern trees near creek; 4 found in a bag of ground litter examined at home.

Linton Forest (2 miles E. of Linton)— —23.xi.1969. Numerous, under fallen branches on the ground in dry eucalypt forest with a grassy ground layer.

Nr. Cape Patterson—365233—4.i.1970. About 8 specimens seen in an area about 18" square, under long decaying grass on the sea cliffs.

San Remo—340249—17.i.1970. Few from rotting grass on the cliff face.

Its cryptic habits here are also typical of the slug in Britain. None of these localities is remote from human influence. At all sites, except Cape Patterson, *A. intermedius* was found with native molluscs, mostly small members of the superfamily Endodontacea which are awaiting full identification. They were found with the native slug *Cystopelta petterdi* Tate at Beaconsfield, Badger Creek and Linton. Introduced molluscs found in association with it were a juvenile limacid slug resembling *Lehmannia marginata* (Müller) at Berwick, and the slugs *Agriolimax reticulatus* (Müller), *Agriolimax* sp. and a limacid slug, both awaiting identification, and the zonitid snail *Oxychilus alliarius* (Müller) at Linton. Specimens of *A. intermedius* from all the above localities have been lodged with the National Museum of Victoria. The specimens

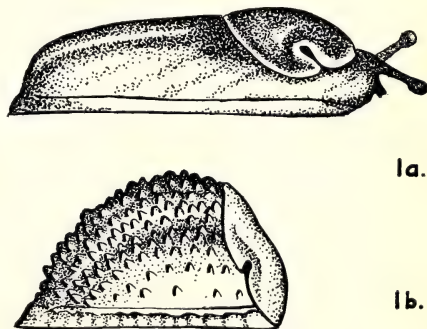


Figure 1. Drawings of *Arion intermedius* (a) crawling and (b) contracted, showing the characteristic conical eminences.

found here show a similar range of colour variation to that seen in Britain.

Cape Patterson and Linton are about 130 miles apart, so that, considering the small amount of search for this slug conducted so far, it seems to cover a fairly wide area of Victoria and is likely to be an introduction of fairly long standing. Earlier workers may have overlooked it on account of its small size and perhaps because it is not obtrusive in gardens as are many of the introduced land molluscs.

Finally, a single juvenile specimen of the genus *Arion* found by a roadside in bushland near Lyonville on 28.ix.1969 appears to be of another species, but for positive identification

further material is needed. This specimen is also lodged in the National Museum of Victoria.

Acknowledgements

I would like to thank Mr. R. Miller for doing the drawings and Dr. B. J. Smith of the National Museum of Victoria for reading the manuscript.

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Australian Natural History Medallion Award, 1969

The late C. A. GARDNER, M.B.E.

by D. L. SERVENTY

It is a melancholy coincidence that what had been intended as a eulogy on the recipient of the 1969 award of the Australian Natural History Medallion should turn out to be also an obituary notice of Western Australia's leading botanist of recent years. When advice of the award reached Perth late last year Mr. C. A. Gardner lay dying of Parkinson's disease in the Home of Peace, Subiaco and he was so incapacitated he could only fitfully recognise his friends. Formal presentation of the Medallion, even at a bedside ceremony, was impossible, but it is satisfactory to record he received the Medallion personally and expressed his keen pleasure at the award. He died on 24 February, 1970.

Charles Austin Gardner was born in Lancaster, Lancs., England, on 6 January, 1896. He was related on his mother's side to the well-known early 19th Century English naturalist, Charles Waterton, of Walton Hall, Yorkshire, who is credited with founding Britain's first nature reserve (see *Animals*, 2 (17), 15 October, 1963; *Country-Side*, 20 (10), Summer 1967).

His family migrated to Western Australia late in 1909 to take up farming at Yorkrakine, near Tammin. He early showed an inclination to botany and art, and studied painting under J. W. Linton, winning a prize for a flower painting at the Perth Royal Show of 1916. He began his career as a clerk with the National Bank but was encouraged in his botanical interests by the late Mrs. Emily Pelloe (authoress of the classic *Wildflowers of Western Australia*, 1921) and Dr. D. A. Herbert. In 1920 he obtained appointment as a botanical collector

with the Forests Department, under the Conservator, C. E. Lane-Poole. In the following year he was attached as botanist to the Kimberley Exploration Expedition under Surveyor W. R. Easton. This resulted in his first scientific publication, the substantial "Botanical Notes, Kimberley Division of Western Australia," published in 1923 as Bulletin No. 32 of the Forests Department. In the same year he published the first part of what was to become a lengthy series, "Contributions to the Flora of Western Australia", in the *Journal of the Royal Society of Western Australia*.

In 1924 he transferred to the botanical branch of the Department of Agriculture, under the Economic Botanist and Plant Pathologist, W. M. Carne. When Carne left to join the CSIRO (or CSIR as it then was) in 1928, this office was divided. Gardner was officially appointed Government Botanist and H. A. Pittman became the Plant Pathologist. The State Herbarium was formally established in that year with Gardner as its first Curator, but, of course, the botanical collections had started accumulating many years earlier. Gardner held this post until 1960, when he reached the statutory retiring age.

The office of Government Botanist was abolished when he retired, and his successor as Curator of the Herbarium, Mr. R. D. Royce, was styled as Officer-in-Charge of the Botanical Branch within the Biological Services Division, whose Chief was Mr. C. F. H. Jenkins (formerly the Government Entomologist).

In 1937 Gardner was appointed the first Australian liaison officer to the Kew Herbarium in England and on

his return he re-organized the Western Australian Herbarium and began the preparation of a Flora of Western Australia. This had been foreshadowed in his most useful *Enumeratio Plantarum Australiae Occidentalis*, published by the Government Printer in 1930, and still an important reference among local naturalists. Among other offices he held are the following: part-time lecturer at the University of Western Australia; member of the National Parks Board and Hon. Consulting Botanist to the King's Park Board. In the earlier years of the University Botany Department, before the department was adequately staffed, he was frequently one of the leaders in class field trips in the neighbourhood of Perth. In latter years, with the growth in popularity of organized wildflower tours in the State, he was engaged two or three times each year as a botanical guide and lecturer by the W. A. Government Railways on wildflower tours in the Geraldton and Murchison areas. He lectured frequently to various organizations and was a well-known broadcaster in radio sessions.

In connection with his scientific work he travelled widely over the State, and continued field collecting long after his official retirement. He was essentially a taxonomic botanist with ancillary interests in ecology. His publications include a book on the grasses, another on poison plants (jointly with the veterinarian H. W. Bennetts), and before he became ill last year was engaged on two further books—one on the genus *Eucalyptus* and the other on the genus *Banksia*. Popular books include the handsome volume, *Wildflowers of Western Australia*, published by West Australian Newspapers Ltd. in 1959, illustrated by paintings by Edgar Dell and colour photographs by Gardner himself.

His total botanical writings, between

1923 and 1962 have been listed by the Department of Agriculture and cover 18 closely-typed foolscap pages (a copy is held at the Royal Botanic Gardens, Melbourne). He described 8 new genera and some 200 new species of Western Australian plants. Perhaps the most outstanding of these was *Pilostyles hamiltonii*, the first member of the Rafflesiaceae (hitherto known only from the New and Old World tropics) to be recorded from Australia. It is still only known from South-Western Australia where it is parasitic on the genus *Daviesia* (Papilionaceae). A remarkable underground orchid, discovered at Corrigin, Western Australia, in 1928 was named *Rhizanthella gardneri* after him by Dr. R. S. Rogers, of Adelaide.

His botanical explorations in the Kimberley Division in 1921 gave him a life-long interest in phyto-geography, a subject which figured in numerous papers, culminating in his presidential address to the Royal Society of Western Australia in 1942 and his summary article, "The Vegetation of Western Australia", in the collective work, *Biogeography and Ecology in Australia* (The Hague, 1959). Among his ecological papers, one on the relations between the Western Australian flora and fires (published in the *Western Australian Naturalist* in 1958) aroused widespread interest and some controversy but most naturalists are generally satisfied at the soundness of his conclusions.

As a botanist intimately involved in field work he would naturally become very much concerned, virtually obsessed, with problems of conservation. He was unceasing in his advocacy of the creation of large reserves in the various major habitats of the State. Mainly through his own personal efforts he was instrumental in persuading the Government to proclaim the following five extensive flora

reserves: (1) at the lower Murchison River; (2) the Hill River Reserve (Mt. Lesueur); (3) the reserve south of Southern Cross (Lake Cronin); (4) the country between the Gairdner and the Hamersley Rivers (including the wildly picturesque Barren Range), and (5) Cape Arid and Israelite Bay. After his retirement from Government service he felt freer in making forceful comments on conservation issues and on the misuse of lands in the pastoral areas.

He received numerous honours. In 1949 the Royal Society of Western Australia bestowed its Gold Medal on him and in 1961 he was awarded the W. B. Clarke Medal of the Royal Society of N.S.W. He was elected an Honorary Member of the Royal Society of W.A. and of the Western Australian Naturalists' Club (of which he was one of the founders in 1924). In the Queen's birthday honours list of June 1965 he was awarded an M.B.E.

I would like to end with a personal tribute to a close friend of 46 years, in office, laboratory, the bush and in the home. Everyone had an affection for Charles Gardner and at his funeral, when we gathered for the last farewell, some of his numerous colleagues, many of whom had known him for longer than I had, agreed that anecdotes about this lovable character would fill a volume. He had his eccentricities, rather more amiable perhaps than those of his forebear Waterton. There were irritating frustrations due to his lapses as a correspondent. We recalled how we had to wait determinedly at his desk, refusing to leave until he had identified our collections of plant specimens. He accomplished a lot but we wanted more from him. There was such a lot he knew but hadn't put on paper, and which now, alas, has gone to the grave with him. In the field he was a congenial and refreshing companion.

Even in his latter years he could out-walk almost all of us. Only an emu could keep up with him, it was said. Like many of his generation he did not own a motor car until well on in life and he was a nervous driver in town, though a Jehu on country roads. However in his pre-car days he was a confident motor-cyclist, riding large expensive machines. I recall in the early 1930's, when I was car-less, being a trusting pillion passenger on his magnificent Brough-Superior.

After hours, in his bachelor home, he was always a delightful host. He tended to compartmentalise his interests and segregate his friends, even his family, accordingly. Thus some visiting botanists might have considered him as only a self-centred botanist, but he really had an unusual variety of cultivated interests. He was keen on astronomy and surveying. He was passionately fond of good music, a devotee of Bach, had a taste for antiques, and was an accomplished painter of trees and bushland scenes. A painting of his, of Yorkrakine Rock, a familiar scene of his boyhood days, hangs in Parliament House, Perth. But almost all his paintings he retained at home; he was very reluctant to give any away and once confided to me that he dreaded holding an exhibition for fear he might be persuaded to part with a canvas or two. I am one of the few friends to whom he gave a picture—a pleasant water-colour of a swamp scene near Perth which he promised to me when I went to Cambridge, to remind me of home, but which I never actually got from him until I returned in 1934. His loss is all the harder to bear as it was comparatively sudden. Until about September last year, although he was becoming physically frail, he was up and about and expecting to continue his botanical writings for some time to come.

In appreciation of the late Thomas Francis Zirkler

The club has suffered a sad loss with the death on 29 March of Frank Zirkler, who joined the F.N.C.V. in 1957, and throughout the succeeding years took a most active part in the club's activities. In doing so, he endeared himself to all by his capacity for friendship and his example of willing participation.

Regular attendance at club meetings, group meetings, and excursions was supplemented by sterling work for the annual nature shows.

In the years 1960 and 1961 he was chairman of the Botany Group, and in 1965 was its secretary.

In 1962 he and his wife Jean (both grown up in Kerang, where Frank was born in 1904) enjoyed a trip to England, where they made contact with a number of clubs like ours and took part in outings with them. Frank joined the Kent Trust for Nature Conservation, retaining his membership ever since. While staying in London, they made many visits to Kew Gardens; and another highlight of their English sojourn was Peter Scott's Slimbridge in Gloucestershire.

Frank became interested in gemstones, gradually acquiring a good collection; and he enjoyed doing his own tumbling of interesting rock specimens picked up on the many excursions he took part in. He exhibited regularly at Geology Group meetings. Among his contributions to the *Naturalist* were articles on the 'Welcome Stranger' and 'Holtermann' nuggets of gold. He delighted in recalling incidents on the Tasmanian and Queensland F.N.V.C. excursions.

Frank's paternal grandfather migrated to Victoria as a mining engineer, and his own vocational field was aeronautical engineering. He was a great lover of good music, an interest shared with his wife, to whom the club offers sincere condolences.

J.A.B.

Field Naturalists Club of Victoria

GENERAL MEETING

11 May 1970

The President Mr T. Sault was in the chair and approximately 110 members were present.

He welcomed Mr Darrell Kraehenbuehl, secretary of the South Australian Field Naturalists.

Sympathy was expressed with Mr Hargreaves the Secretary of the S.G.A.P., on the death of his wife.

The Secretary, Mr. D. Lee, reported that 10 acres of land at Glen Waverley with almost the original ground cover of trees and shrubs, the only remaining natural locality in the area is in danger of development. Ratepayers want the Council to reserve it.

Mr. Garnet said that he had visited Boort recently, and had seen a lake that had been dry for a long time, now refilled through a channel. Pelicans have taken over and they had rounded up the red-fin fish, herding them towards the channel in such concentration that the fish had been crushed, and died of suffocation. Trees were labelled "possums nest here", "hawk's nest", "Shield tree", and a site of an aboriginal camp was indicated. Mr Baines pointed out that Boort meant "smoke" in aboriginal.

Mr. J. Willis said that he had found the Australian Anchor plant *Discaria pubescens* fifteen years ago on a basal

escarpment near Clunes. It was first noted by Major Mitchell. Yesterday Mr. Willis went back and found the same plants.

Mr Jean Woollard mentioned that cobwebs were spread like cloth on bracken on the road to Walhalla where rough tree ferns were well grown and plentiful.

The subject for the evening was "Banksias and their Relations of the family Proteaceae", by Mr. F. J. Rogers.

The President introduced the speaker and said he was the author of *A Field Guide to Victorian Wattles* and active in the Society for Growing Australian Plants.

Mr Rogers said there were about 650 species and 31 or 32 genera of the family Proteaceae in Australia. With the aid of beautiful colour slides he explained the features of the typical four-partite flower, and contrasted it with a mistletoe flower which also has four flower segments.

He illustrated the hard woody seed receptacles in *Banksia grandis*, *Hakea platysperma* and the *Xylomelum* woody pear but in *Persoonia* the seed is not in a hard case. Some, as in coast *Banksia*, shed their seed almost immediately, but in many others it is not shed until conditions are very dry or after a forest fire as in Waratah and Woody Pear.

He showed beautiful slides of many species of the genera *Banksia*, *Hakea*, *Grevillea*, *Lomatia*, *Synaphea*, *Persoonia*, *Petrophila*, *Lambertia*, *Isopogon*, *Orites*, *Franklandia*, *Dryandra*, *Adenanthos*, *Buckinghamia*, *Stenocarpus*, *Conospermum* and *Telopea*.

He recalled that Banks and Solander 200 years ago first collected *Banksia serrata*, *B. integrifolia*, and the handsome *B. ericifolia*. Recently Mr Willis named *B. canei*, from Wulgulmerang.

Of the more than 40 species of Banksia projected on the screen, most striking ones included the beautiful red *Banksia coccinea*, pink *B. menziesii* (extensively used for fire wood in W.A.), orange *B. ashbyi* and *B. prionotes*, long yellow heads of *B. grandis* with the massive collection of seed capsules.

Pendant types included orange *B. nutans*, yellow *B. elderiana* and *B. lehmanniana* with large flowers.

Prostrate species included red-brown *B. prostrata* reddish yellow *B. repens* and *B. goodii* (named after Good—bota-

nist with Flinders 1801-2) and the "Cocky's beak" *B. candolleana*. Low growing *B. baueri* has a massive head of flowers 9 inches by 5 inches. Cockatoos feed *B. speciosa* seeds.

While the majority of Banksias are in W.A., *B. robur* is a striking Queensland form and *B. spinulosa* a handsome Victorian one. Of the twenty four grevilleas shown shades of red were most noticeable. Some of the West Australian red forms included *Grevillea wilsonii*, *G. macrostylis*, *G. tripartita*, many of them showing three partite leaves. *G. flexuosa* is a pink form and *G. polybotrya*, *G. occidentalis*, and *G. teretifolia* white.

Red *G. punicea* is a N.S.W. species while Victorian forms shown included pink *G. confertifolia*, golden *G. chrysophea*, red *G. dimorpha*, pink *G. barkleyana* red shaded *G. alpina*; and from Queensland orange *G. robusta*.

The 16 Hakeas shown revealed striking contrasts, the West Australian *Hakea victoriae* with expanded multicoloured tough leaves sheltering clumps of insignificant flowers, and the handsome long pink spikes of *H. multilineata* and reddish *H. bucculentia*, the pink *H. subsulcata*, red and white *H. laurina* and "sea urchin" *H. petiolaris*, and purple *H. myrtoides*. Red *H. orthorrhyncha* had red flowers on old wood. *H. verrucosa* showed spidery red flowers well down amongst widely spread out leaves.

From Victoria *H. nodosa* with small yellow flowers and pink *H. sericea* were shown.

Other West Australian forms included purple *Dryandra erythrocephala* and yellow and red *Lambertia inermis*, red *L. orbifolia*, yellow *L. echinata* and, from N.S.W., red *L. formosa* (mountain devil). *Isopogon drummondii* and *I. tridens* were W.A. forms.

Victorian *Telopea oreades* was outshone by the *T. speciosissima* of N.S.W. — perhaps the most splendid species of the family. Mr. Rogers recommended growing species of Proteaceae in gardens.

The President thanked Mr. Rogers for the most interesting talk and the slides.

Mr. L. Fell pointed out that many of the species could not be grown here except under special care.

The Secretary reported that the Ingram Trust has granted funds to print the Nature Show pamphlet which features penguins.

He said the C.S.I.R.O. are testing the hall for sound equipment and it is hoped

that there will be fixed amplifiers and a movable microphone.

Mrs. G. Taylor stressed the importance of the Save the Bushlands Meeting in the Lower Town Hall on 19 May.

Mr. R. G. Taylor spoke on the danger to one unspoiled area in Victoria from an application for rutile, zircon and ilmenite exploration of 100 miles along the coast from Shipwreck Creek to seven miles west of the Snowy River, and for one mile inland all the way.

Mr. Garnet said that if mining companies get permission it would mean clearing away the top from the dunes by dredges and destroying everything.

Mr. Taylor moved that the F.N.C.V. Council write to the Minister of Mines to protest against giving of this permit. Mr. Garnet seconded the motion which was carried. It is regarded as the most serious issue since the "Little Desert".

The Native Fauna Conservation Society meeting will be held on 29 May at the Herbarium. Mr. Keith Dempster of the Fisheries and Wildlife will speak.

The Secretary said that if anyone wishes to be met at the corner of St. Kilda and Domain Roads to go to the Herbarium they could telephone 25 2415.

Dr. Brian Smith is making a survey of Non Marine Molluscs of Victoria. He appeals for members to assist by sending live specimens to the Museum, noting the locality.

The President asked for short contributions of nature observations to be sent to the Editor.

Mr. D. McInnes invited members to a Geology excursion on Sunday, 7 June, to the Maribyrnong River terraces.

Six new members whose names appear in the May Naturalist were elected.

Exhibits

Brent Russell brought three kinds of butterflies showing variation; i.e. Wanderer, Common Brown and Wood White.

Mr. A. J. Swaby had sporophytic buds on *Polystichum proliferum* and plants of *Pratia surrepens* — the latter for any members wishing to have one. Also a specimen of *Marchantia* with gemma cups.

Mr. Rogers had a large collection of fruits of the Proteaceae.

Mr. J. Morrison showed a fungus *Amauroderma rude*.

Mrs. Matches brought wood with blue *Mycena interrupta* and *Xerotus archeri* — fungi from near Fernshaw.

Other fungi from the Botany Group excursion between Dom Dom and Fernshaw included: *Trametes versicolor*; *Tyromyces semisupinus*; *Polyporus camytus*; *Schizophyllum commune*; *Marasmius* sp.; *Paxillus panuoides*; *Panettus stipticus*; *Merulius* sp.; *Hymenogastrea* (underground); *Xerotus archeri*.

Mr. T. Sault: A box of fungi from Mornington Peninsula and a *Chrysalis* of a wood white butterfly.

Mr. Ken Strong showed a book scorpion under the binocular microscope.

Major H. Ford had a specimen of tachylitic basalt from Maidstone.

Mr. Curtis showed a slide of Truganinni, the last full-blood aborigine of Tasmania, who died about 90 years ago. This slide was made from a photograph lent by Mr. Vic Miller.

Mr. Darrell Kraehenbuehl pointed out that actually the last Tasmanian full-blood aborigine had died on Kangaroo Island, 1884, thus later than Truganinni.

Mr. Hanks said that Truganinni had wanted to be buried, but it has been said that the bones were put in a museum to keep them from being stolen.

* * * *

Flowers and Plants of Victoria in Colour

Copies of this excellent book are still available, and of course would make a wonderful gift. They are obtainable from the F.N.C.V. Treasurer, Mr. D. McInnes.

Western Victoria Field Naturalists Clubs Association

Report on Club Activities for year 1969

(Compiled by J. Lineker, Hon. Secretary, Portland F.N.C.)

Reports from other Clubs will appear next month.

ARARAT

President: Mr. Stan. Kelly. Secretary: Miss Z. Banfield.

Membership 12 *Meets First Monday, C. of E. Hall.*

The Club held excursions with the Stawell Club and the Ballarat Club to the Mt. William picnic ground. The Club again exhibited a box of wildflowers from the district at the Nature Show in the Melbourne Town Hall, and also at the Barrier Field Naturalists Show at Broken Hill. Club members participated in an outing when 100 school children from Forest Hill school visited the district and were conducted through McDonald Park on a nature trail. The Club has been represented at the WVFNCA meetings at Colac and Kiata, and with Stawell were the hosts at the Annual Meeting at Stawell. During the year the President of the Bird Observers Club—Mr. Reg Johnson—visited Ararat and gave an illustrated lecture—"In the footsteps of Capt. Cook".

COLAC

President: Mr. R. J. Dennis. Secretary: Mrs. G. Skinner.

Membership 55 *Meets Second Friday (Feb.-Dec.) C.W.A. Rooms.*

Membership has increased this year and the attendance at meetings has improved greatly—attributed largely to the excellent guest speakers, and also the regular monthly excursions. One very pleasing factor is the growing number of school children attending meetings and excursions. Natural history covering fossils, ornithology, reptiles and botany has catered for all interests, and the specimen table has been a source of knowledge and interesting discussion.

The autumn meeting of the WVFNCA was held in Colac with our club acting as hosts. The excursions were around the local lakes and a picnic lunch at Beauchamp Falls near Beech Forest.

Our interest has been keen in the conservation field, especially the Little Desert and the Lower Glenelg areas; and we have co-operated in a tree planting expedition to the You Yangs. A proposal that we become caretakers of an area of approximately 1/3 acre at Barongarook and develop it as a members' plantation is receiving enthusiastic support and could develop into a worthwhile project.

We have been well represented at the WVFNCA meetings and in conjunction with the Geelong Club have had a series of investigation campouts in certain areas in the Otways with a view to having them preserved as National Park.

CRESWICK

President: Mr. A. W. Strange. Secretary: Mr. H. L. Barclay.

Membership 24 *Meets Second Thursday, Wesley Hall, Creswick.*

Meetings had a high percentage of attendance throughout the year, and various speakers contributed syllabus items. Two highly successful nights were contributed by members who had done much research work in preparation of their addresses. Outings were numerous and well attended.

During the year the Club has been successful in having obtained an area of land being held by the Lands Dept. as a Flora Reserve—the Club is working on checking the plant life here with the Plant List of the District.

DONALD

President: Mr. R. P. Falla. Secretary: Mrs. B. K. Grewar.

Membership: Adult 27, Junior 9. *Meets First Friday Primary School Centre.*

Another successful year has maintained the interest and enthusiasm of members and the nine meetings have given an excellent average attendance. A feature of the programmes has been the increased contributions by club members. Representation of members was good at the WVFNCA meetings at Colac and Kiata, and with the Stawell Club an excursion was held through the Barkly and Redbank districts. A local excursion of much interest was to see some of the rarer trees of our own district. A conservation project, in co-operation with the Shire Council, is to have the Mt. Jeffcott area proclaimed a Reserve.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.

Patron:

His Excellency Major-General Sir ROHAN DELACOMBE, K.B.E., C.B., D.S.O.

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Mr. T. SAULT

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Mammal Survey: Mr. P. HOMAN, 40 Howard Street, Reservoir 3073.

Entomology and Marine Biology: Mr. J. W. H. STRONG, Flat 11, "Palm Court", 1160 Dandenong Rd., Murrumbeena 3163 (56 2271).

Geology: Mr. T. SAULT.

MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available, and other activities are indicated in reports set out in the several preceding pages of this magazine.

Rates of Subscriptions for 1970

Ordinary Members	\$7.00
Country Members	\$5.00
Joint Members	\$2.00
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Junior Members receiving Vict. Nat.	\$4.00
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The cost of individual copies of the **Vict. Nat.** will be 45 cents.

All subscriptions should be made payable to the Field Naturalists Club of Victoria, and posted to the Subscription Secretary.



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the **VICTORIAN NATURALIST**

Vol. 87, No. 7

July, 1970



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F.N.C.V. DIARY OF COMING EVENTS

GENERAL MEETINGS

Monday, 13 July—At National Herbarium, The Domain, South Yarra, commencing at 8 p.m.

1. Minutes, Reports, Announcements.
2. Nature Notes and Exhibits.
3. Subject for the evening—"A Biological Survey of Victoria": Mr. R. T. M. Pescott, retiring Director of the National Herbarium and Royal Botanic Gardens.
4. New Members.

Ordinary:

Mrs. Alice Ryan, Flat 25, 150 Inkerman Street, St. Kilda, 3182.

Joint:

Messrs. J. B. & R. N. Jack, 9 Glendale Street, Surrey Hills, 3127. (Interest—Geology.)

Country:

Mr. Peter Robson, Tatong, via Benalla, Vic., 3672

Mrs. D. Algic, "Balgowan," Neerim South, 3831.

5. General Business.
6. Correspondence.

10 August — To be announced.

GROUP MEETINGS

(8 p.m. at the National Herbarium unless otherwise stated.)

Thursday, 9 July—Botany Group. Mr. P. Kelly will speak on "Moulds."

Wednesday, 15 July—Microscopical Group.

Friday, 31 July—Junior meeting at 8 p.m. at Hawthorn Town Hall.

Monday, 3 August—Entomology and Marine Biology Group meeting at 8 p.m. in small room next to Theatrette at National Museum.

Wednesday, 5 August — Geology Group. Subject — Koonwarra and the Fossil Feather: Mr. P. Duncan.

Thursday, 6 August—Mammal Survey Group meets in F. & W. Research Centre, cnr. Brown St. and Stradbroke Ave., Heidelberg, at 8 p.m.

Friday, 7 August—Junior meeting at Rechabite Hall, 281 High St., Preston, at 8 p.m.

Thursday, 13 August—Botany Group. Mr. B. Fuhrer will speak on "The Seaweeds of Boags Rocks."

Friday, 14 August—Montmorency and District Junior F.N.C. meets at 7.30 p.m. in Scout Hall at Petrie Park.

F.N.C.V. EXCURSIONS

Sunday, 12 July—Botany Group Excursion, Westernport Bay. Meet at Frankston Railway Station. Bus leaves from Station at 11 a.m. if insufficient private transport.

Sunday, 19 July—Dandenongs. The coach will leave Batman Avenue at 9.30 a.m. Fare \$1.40. Bring one meal.

Sunday, 9 August—Botany Group. Wattles at Warrandyte. (Ring Mr. Kleinecke—25-2415).

Saturday, 29 August to Sunday, 6 September—Wyperfeld National Park and Little Desert camp out. The plan is to travel to Wyperfeld on Saturday, 29 August remaining there until Wednesday, 2 September, then going to Broughton's Waterhole in the Little Desert where we will meet local naturalists who are planning that section of the excursion. Members will be responsible for their own food and camping gear but a larger tent will be taken where meals can be eaten and members gather if it is cold. Food supplies can be replenished during the week. The coach fare will be \$18.00 and this should be paid to the excursion secretary by the end of July. All cheques to be made out to Excursion Trust. Camping gear can be hired very cheaply if necessary.

Saturday-Sunday, 17-18 October—Weekend excursion to Castlemaine with the Bendigo F.N.C. Motel accommodation has been booked and the weekend should cost approximately \$14.00 plus picnic meals Saturday and Sunday.

The Victorian Naturalist

Editor: G. M. Ward

Assistant Editor: E. King



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9 July, 1970

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Front Cover:

This skilfully executed pencil sketch is the subject of an article on page 204. It was drawn by Von Guerard, and dated 1857.

July, 1970

183

Some Observations on the Relative Drought Resistance of Two Eucalypt Species near Airey's Inlet

by J. B. KIRKPATRICK*

The 1967/8 drought in Victoria was so severe that many eucalypts were damaged or killed. This provided an excellent opportunity to study the relative resistance to moisture stress of associated species of eucalypts. Where species that are found generally in areas of distinctly different rainfall, occur in association on the margins of their distribution, evidence of drought damage was most likely to be found.

Observations of such an ecotonal association were made in May 1968, and again in October 1969, to assess

relative damage and recovery. The study area was north of Airey's Inlet in the Otway Ranges. It was on mudstones of Jurassic age at an elevation of 400 feet, on the northern slope of the Painkelac Creek valley, on a steeply declining north-south ridge (Figure 2). The stand consisted of an equal mixture of Blue Gum (*Eucalyptus globulus* x *bicostata*) and Ironbark (*E. sideroxylon*) with an occasional Messmate (*E. obliqua*). Downslope towards both Painkelac

*Research student, Melbourne University Geography Department.

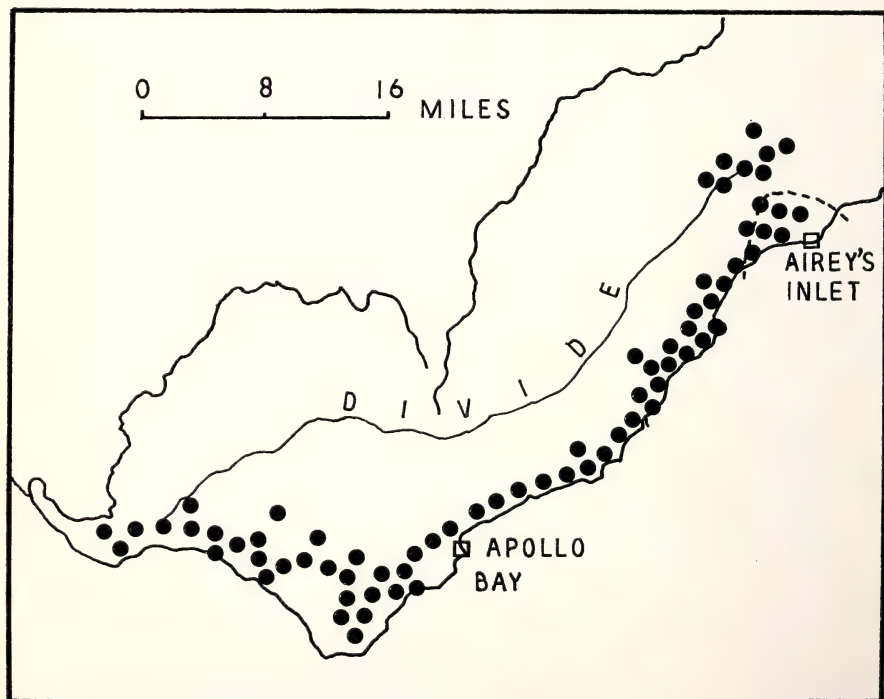


Figure 1. The distribution of Blue Gum (dots) and Ironbark (limits shown by dashed line) in the Otway Ranges.

Creek to the south and the two ill-defined valleys to the east and west, the Blue Gum became progressively more pure, being replaced on the alluvium on either side of the creek by Manna Gum (*E. viminalis*). Upslope the Ironbark was associated mainly with Messmate, although an occasional Blue Gum and Scentbark (*E. aromaphloia*) occurred. On nearly northern aspects Peppermint (*E. radiata*) formed a sparse low sclerophyll shrub woodland where an occasional stunted Ironbark was observed. Figure 3 looks south over this association towards Painkelac Creek. The study area is not visible, but similar drought damage is evident in the photograph, directly opposite

it on the southern slope of the valley.

The Blue Gum in the Otway Ranges is a probable hybrid swarm, showing a complete range of intermediates between *E. bicostata* and *E. globulus*. It occurs mainly in a relatively narrow coastal strip, but is also found on parts of the more easterly north-facing slopes (Figure 1). Its distribution in the Otway Ranges is disjunct from the nearest occurrences of both putative parent species. Bass Strait and the low rainfall basalt plains to the north having probably been effective barriers to recent gene-migration. It occurs between the 30 and 60 inch mean annual isohyets, mainly on acidic sandy clay loams over mottled yellow clay

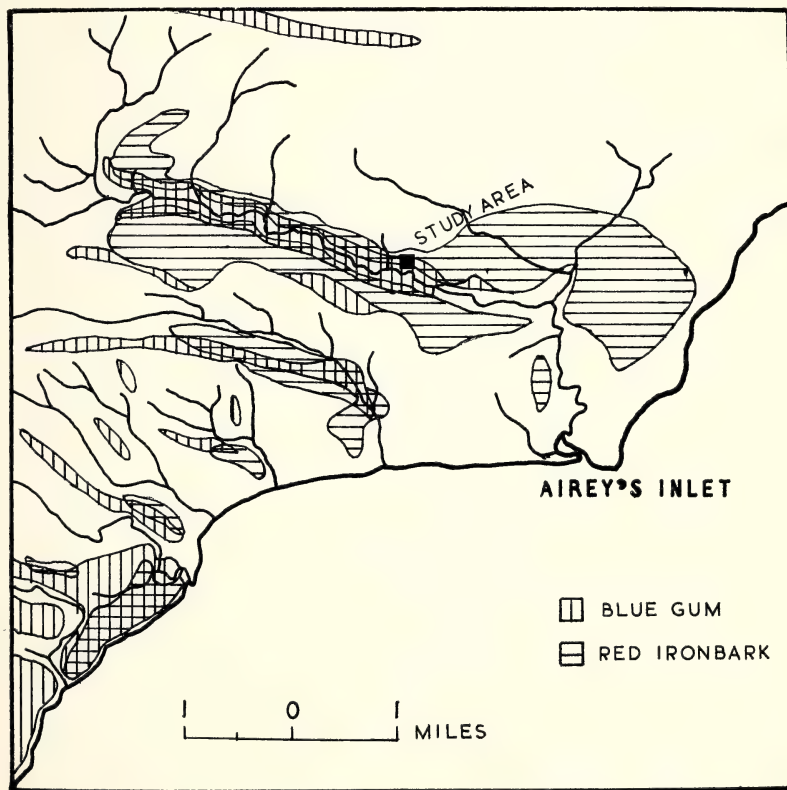


Figure 2. Detailed distribution of the two species in the Airey's Inlet region.



Figure 3.

A drought affected stand of Blue Gum shows up as a white strip amongst the dark colour of the surrounding healthy trees at the top left (see text).

subsoils formed on Jurassic sandstones and mudstones.

Ironbark, in contrast to Blue Gum, is only found in a limited area of the Otway Ranges around Airey's Inlet on the seaward slopes. The nearest stands are in the Anakie Ranges to the north of the basalt plains. It is found between the 27 and 33 inch mean annual isohyets on both similar soils to Blue Gum and on sandy acidic yellow mottled soils, often with embedded ironstone, formed on Tertiary deposits. It associates more extensively with Mountain Grey Gum (*E. cypellocarpa*) and Messmate than with Blue Gum and also associates ecotonally with Peppermint, Scentbark, Manna Gum and Swamp Gum (*E. ovata*).

Ironbark and Blue Gum are rarely found growing together outside the Otway Ranges, Blue Gum being a tree of wetter forests than those in which Ironbark usually occurs. In the limited area of the Otway Ranges where both are found both ecotones and abrupt boundaries are observable (Figure 2), depending on the steepness of the environmental gradient. The Ironbark stands occupy areas which, compared with Blue Gum stands in the vicinity, would appear to have less available moisture. Thus Blue Gum is found downslope from Ironbark and on the less exposed aspects of hillsides and ridges.

The stand studied was apparently even-aged, the trees having the appearance of saplings, varying in height from approximately ten to twenty feet. The Blue Gums were almost all taller than the Ironbark. Of the sixteen Ironbark trees only one had even partial drought symptoms, yet of sixteen Blue Gums in the same stand all but one were severely affected, most of them having all their leaves killed by the drought, and no signs of epicormic shoots developing in May 1968. By October 1969 there were epicormic shoots on most of the Blue Gum, but some of the smaller trees had died and none looked particularly healthy.

The difference in size between the two species suggests that Blue Gum might suppress Ironbark when there is adequate moisture for Blue Gum to establish itself. The author has seen suppressed Ironbark under Blue Gum elsewhere in the Otway Ranges, which would tend to support this theory.

The incidence of drought effects suggest that Ironbark, possibly because of its slower growth rate, has far greater tolerance to drought conditions than Blue Gum.

Acknowledgements

I would like to thank Dr. R. F. Parsons for help with the work and Dr. E. C. F. Bird for critically reading the manuscript.

Readers' Nature Notes and Queries

Wombat On Vermin List?

Here is a note of concern for one of our native animals from Ellen Lyndon in Victoria.

Among the various displays touring the country Agricultural Shows last summer, was one set up by the Vermin & Noxious Weeds Destruction Board, dispensing information to farmers on the most effective means of dealing with plant and animal and other pests.

At Leongatha Show on 21/2/70 four mounted specimens of "vermin" were on view; the fox, rabbit, hare, and the wombat. As Australians we felt ashamed that a harmless native herbivore should be classed and displayed with the introduced pests.

Reptilian Memory

From Mr. J. C. Le Souëf, son of the early Naturalist, Dudley Le Souëf, come these interesting comments on Reptiles and Birds.

Although one does not usually associate memory with reptiles, a recent incident at the Rosebud Aquarium and Museum seems to indicate that at least the Amythestine Python from North Queensland does have the ability to recall earlier conditions.

One fifteen foot specimen, picked up on the Bloomfield Road, at the Lion's Den, near Cooktown in July 1968, had spent last summer in a large netted enclosure outside, sleeping on cool nights in a box on the ground. During the winter it was housed in a heated case inside the building.

It was recently returned to its summer quarters. As soon as the sun had left its basking plank, it at once moved directly to its den on the ground. By its actions, it seemed obvious that it was quite familiar with

its surroundings in contrast to the usual practice of the new arrival in making a long tour of inspection before settling down to a regular camping spot.

Cockatoo Playground

The sight of cockatoos "playing", particularly on telegraph wires, is well known; but the existence of a communal playground, used by two different species seems worth recording.

Near the Diversion Dam at Kununurra in North West Australia there is a green sward beside a small lagoon with power lines passing behind it. One evening in July last, I spent half an hour watching the antics of some two hundred corellas, part of the tremendous flock which inhabits this area. At first I thought that they were feeding, but a second glance showed that they were having a real "box on". Everywhere pairs could be seen rolling over and over with much squawking. The twos would separate only to start on another neighbour.

The power lines provided a trapeze with a constant stream of birds flying from the ground to the wires, swinging upside down on the wires and returning to the ground again.

After tiring of the fun, they flew off to neighbouring roosting trees by the water, others coming in to take their places.

The population of galahs is not nearly as great as that of the corellas, although there were quite a number about. Early on the same day the local galah population used this same playground for their "daily dozen", before setting off for the serious business of searching for food.

book review

Australian Opals in Colour

by Nance and Ron Perry, F.G.A.A.

A. H. & A. W. Reed, 1969.

Pp. 112, inc. 86 col. p11. \$3.95.

Bert sent down the billy. "Not that," I shouted. "Send down the four-gallon drum."

Thus was one of the biggest lumps of opal ever found brought to the surface at Coober Pedy; and with a conversational approach this book provides an interesting though in parts somewhat superficial introduction to Australian opal fields, and of the distinctive way of Australian life found upon them.

Lightning Ridge, Coober Pedy, Andamooka and Queensland fields are discussed, various facets of their community life illustrated by photograph, and the shadows of outback history lengthened a little in the book's easy account of opal-miners and their outlook, as well as in its telling of such legendary figures as Isobel MacIntosh the Eulo Queen.

Wisely incorporated however are valuable contributions from Gaskin, Darragh, and Sanders of C.S.I.R.O.

on opal in general, its nature and origin, and upon synthetic opal research. From the Queensland Mining Journal there is a section on the "Kernal Bands". Other chapters deal with types of opal mining, how to cut opal, opal doublets and triplets, treatment of opal chips and points on buying and selling. Practical advice given for intending travellers includes reference to facilities available in various areas and their likely costs. The inclusion of a list of spare parts needed for vehicles taken into opal country is timely.

The authors have a love for this truly beautiful Australian gem, and an awareness of its potential on the Australian scene. The glory of opals emerges from its excellent colour plates. The book opens a door for those unacquainted with opal seeking as a pursuit of increasing popularity and fascination.

(A. R. McEvey)

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Address orders and inquiries to Sales Officer, F.N.C.V., National Herbarium, South Yarra, Victoria.

Payments should include postage (9c on single copy).

Wolf Creek, Australia's Largest Meteorite Crater

by

A. W. BEASLEY*

Few people know that Australia possesses the second largest crater in the world that is definitely known to be caused by meteorite impact. This huge crater is situated near Wolf Creek some 65 miles south of Halls Creek in Western Australia, and is known as the Wolf Creek meteorite crater.

In recent years there has been increased scientific interest in meteorite craters because of the presumed kinship between the craters on the earth's surface and those on the moon. This has resulted in more detailed study of the Wolf Creek and other meteorite craters.

The Wolf Creek crater was discovered in 1947 by Dr. F. Reeves and Mr. N. B. Sauve of the Vacuum Oil Company during an aerial reconnaissance of the area. Dr. Reeves reported (Reeves and Chalmers, 1949) that from the air it looked like a huge bomb crater and that, on first sighting, they thought it to be of meteoritic origin. Soon after its discovery, a land inspection was made by Reeves but, during the short time spent at the crater, no meteoritic material was found.

During 1948 a geological party from the Commonwealth Bureau of Mineral Resources, headed by R. S. Matheson and D. J. Guppy, examined the crater and discovered evidence of its meteoritic origin. They found fragments of meteoritic ironstone scattered around the crater rim, particularly along the southern sector. Guppy and Matheson (1950) gave the first detailed description of the crater.

The crater is situated in an area covered by loose sand with occasional low dunes and sparse vegetation. Precambrian quartzites outcrop a few miles north of the crater and these rocks are also exposed in the crater walls. Viewed from the land the crater appears as a flat-topped hill that rises 70 to 100 feet above the adjacent sandy desert. The outer slope varies from 10 to 15 degrees, and consists of piles of unsorted, broken quartzite.

The average depth of the crater below the rim is 160 feet, or an average depth of 70 feet below the general land surface. The crater was originally somewhat deeper, but the inner portion has been partly filled with sediments. The inner slope of the crater wall is steep, ranging from 30 to 40 degrees, and the top 90 feet or so of this wall is composed of angular blocks and pieces of quartzite thrown up by the explosion of the meteor. Below this the quartzite bedrock occurs. The quartzites are tilted, generally with an outward dip; this is considered to be due to movement resulting from the meteoric explosion.

The crater is almost perfectly circular; the diameter of the floor is approximately 2,800 feet, while the maximum diameter of the crater from rim to rim is 3,075 feet. The floor is essentially flat and is covered with loose sand and light porous gypsum. There is a very slight rise from the central area to the abrupt face of the crater wall.

Chemical analysis of a sample of the heavy metallic material found

* National Museum of Victoria.

around the crater rim by Guppy in 1948 gave 1.9% of nickel oxide, "which is far in excess of what would be expected in terrestrial rock" (Reeves and Chalmers, 1949). Another specimen of this ironstone, submitted by Guppy to the Western Australian Government Chemical Laboratories, was found to contain particles of metallic nickel-iron. LaPaz (1954) also reported streaks and granules of metal which he considered to be nickel-iron in specimens of this oxidized material.

Pieces of this oxidized meteoritic material were once moderately abundant around and near the crater rim, but have now been extensively collected. They take the form of ball-like bodies of various sizes that range up to 300 pounds in weight (McCall, 1965). Apparently they were formed from the weathering and alteration of meteoritic iron fragments; they are now composed mainly of limonite (hydrated iron oxide).

Taylor (1965) recorded the discovery in 1965 of fragments of typical nickel-iron meteorite around the Wolf Creek crater. Sections cut through these fragments, when polished and etched, showed characteristic Widmanstätten structure. The fragments were found lying on the surface near but outside the crater. Most were of small size. Chemical analysis gave a nickel content of 8.6% and a cobalt content of 0.4%, which is close to the average of all iron meteorites reported by Mason (1962).

The Wolf Creek crater is the result of a meteoric event which was in every way catastrophic. An unusually large meteoric body, probably weighing thousands of tons, reached the earth's surface with most of its cosmic velocity intact. The resulting impact had most of the characteristics of a nuclear explosion. Fortunately, very few large meteors penetrate the earth's atmosphere. Scientists consider that they arrive on the earth probably



Fig. 1: Aerial view of Wolf Creek meteorite crater, Western Australia.

Photo: W. Pedersen.

at the rate of only about forty every million years. Many of them fall in the sea, and large meteorite craters on the earth's surface are accordingly rare. Professor N. M. Short (1967b) lists twelve definite meteorite craters and six probable ones formed during the last two million years. The Wolf Creek crater is second in size to Meteor Crater in Arizona, U.S.A., among craters with associated meteoritic material.

Study of the Wolf Creek crater suggests that it is geologically young.



Fig. 2

Map showing location of Wolf Creek meteorite crater.

Short (1967b) has listed its age as Pleistocene (between 10,000 and 2,000,000 years old). Preservation of the crater has been favoured by the arid climate. The extent of its erosion is not very great, but the crater depression has been partly infilled with sediments. According to Short (1967a) the reason why pieces of meteorite have not been found in great quantity around craters such as Wolf Creek is because such large meteorites become vaporized, fragmented and dispersed during the explosion-like impact.

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Flowers and Plants of Victoria in Colour

Copies of this excellent book are still available, and of course would make a wonderful gift. They are obtainable from the F.N.C.V. Treasurer, Mr. D. McInnes.

Native Mammals in Victoria – IV

Mammals of the Riddell District

by

J. W. F. HAMPTON* AND J. H. SEEBECK*†

SUMMARY

The mammalian fauna of an area of forest in the hills north and west of the village of Riddell in the Shire of Romsey, Victoria, was examined by means of four detailed surveys of representative areas. Thirteen native and four introduced species were recorded. The effect of the severe drought in 1967-68 on the mammal population did not appear to be as drastic as was expected. The value of the area as a faunal reservoir is discussed.

INTRODUCTION

About forty miles north-west of Melbourne a complex group of hills, dominated by Mount Macedon, stands up from the flat surrounding plain. The scrub and forest covered south-eastern slopes with the lesser peaks of Mount Eliza, Mount Charlie and Mount Robertson, form a marked ecological contrast to the open agricultural lands below. The differing soils, rainfall and vegetation on these slopes have given rise to a varied environment and the area has become a refuge for a number of species of native animals. No previous investigations of the mammals present in the area have been reported. A preliminary survey of the mammal fauna was therefore carried out by the Mammal Survey Group in order to assess the value of the

area as a faunal reservoir before the pressures of urban development become acute.

This report describes the results of the work of the Mammal Survey Group during the Spring of 1967 and the Spring of 1968. Three surveys were carried out in 1967, and a year later, one of the areas was re-examined in order to try to assess the effects of the severe drought in the Spring and Summer of 1967-68. Additional data collected in the area at other times is also included in this report.

The names of the members of the Group whose work provided the data upon which this paper is based are listed in the Authors' Acknowledgements.

DESCRIPTION OF THE AREA

History

Much of the hill country was cleared for farming about 100 years ago, but from about 1890 onwards farms were abandoned and gradually reverted to forest. The surrounding plain has, however, remained completely cleared, leaving the hills as isolated areas of forest and scrub. Until the nineteen-twenties commercial quantities of timber were being extracted and some timber cutting is still carried out. The area consists largely of privately owned land with some areas of State Forest and water-catchments.

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Geology

The geology of the area has been described in detail by Skeats and Summers (1912). The soils in the hills are derived from Upper Devonian Kerrie Conglomerates (Surveys 1 and 3) and Upper Ordovician Siltstones (Survey 2) and are generally very sandy and gravelly and of poor agricultural value. Riddell itself lies on Quaternary Olivine Basalt and this formation with its deep, rich soils surrounds the hills on their southern and eastern boundaries.

Rainfall

No official meteorological figures are available for the area which was the subject of these surveys, but the means for Macedon (Forests Commission Office, 23 year record) and for Riddell (Miss Amess's records for the past 17 years) are given in Table I in which is also included the rainfall recorded at Kerrie for 1968 only (record from the Best property at Kerrie). This latter was recorded at a point only 1 mile east of the area of Survey 2.

During the period of the 1967 surveys the spring rains had failed, the countryside was drying up and the first indications were appearing of the severe drought which was to follow. During the subsequent sum-

mer the rainfall in general was the lowest for 30 years.

At all three survey sites the creeks were running at the time of the surveys and it was interesting to find that, though they had all dried up during the summer, the level of water in Main Creek at site 2 was about an inch higher in November, 1968 than in October, 1967.

Areas surveyed

The method adopted by the Group in making a preliminary survey is to select areas which are representative of the different kinds of habitat present and to subject these "sample" areas to fairly intense surveys in which the mammal fauna is methodically examined.

Three areas were chosen for sample surveys and these are shown on the accompanying map (Fig. 1). They are referred to as Survey 1, on Conglomerate Creek, September, 1967; Survey 2a on Main Creek, October, 1967; Survey 2b, at the same site in November, 1968 and Survey 3, near Charlie's Creek in November, 1967.

Survey 1.

The first site chosen was on a rocky, predominantly south-facing slope, immediately above the flat cultivated area, at the point where

TABLE 1.

Rainfall.

Monthly mean in inches for Macedon (23 years) and Riddell (18 years) and the 1968 record for Kerrie.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Macedon	1.76	2.72	2.00	2.62	3.66	3.23	3.94	3.78	3.69	3.91	2.78	2.32	36.51
Riddell	1.79	1.18	2.13	2.42	2.34	3.24	2.41	2.45	2.78	2.56	2.28	1.81	27.39
Kerrie	0.98	0.03	0.91	2.08	7.11	2.95	3.80	4.59	1.23	2.36	1.92	2.47	30.43

Conglomerate Creek flows on to the plain. The creek at this point runs in a narrow, steep-sided, rocky gully. The forest was predominantly of Messmate, open, uneven and with gaps due to felling. The shrub layer was sparse and the ground cover thin on the east-facing slopes but denser on the west-facing slopes. A detailed description of the vegetation is given in the appendix.

Surveys 2a and 2b.

The vegetation on Main Creek at this site was in marked contrast to that at Conglomerate Creek and represented the richest type of habitat to be found in the area. There was a layered forest of more complex composition, up to 100 feet in height, dominated by Manna gum and Messmate near the stream, with Blackwood and Silver Wattle forming the understorey, over a dense and varied shrub layer and a dense, grassy ground cover. The vegetation was less dense and differed on the southern and northern-facing slopes of the valley. This is described in detail in the appendix.

Survey 3.

This site, on the northern face of Mount Charlie, represented the driest type of habitat in the whole area and consisted of sparse Messmate, a shrub layer of widely scattered clumps of young Silver Wattle and very sparse ground cover. The area had been severely burnt two years previously. The forest became more dense on the upper rocky slopes. Most of this survey area has since been cleared.

METHODS

The methods used in this survey have been described previously (Seebeck, Frankenberg and Hampton 1968). Mist nets were not used. Skeletal remains, owl pellets and other similar materials were collected during the survey but these did not provide evidence of any species other than those seen or trapped.

RESULTS

Details of the survey effort and the crude trapping and spotlighting

TABLE II.

Summary of survey effort, trapping and spotlighting data and daylight sightings.

Survey No.	Date	Trap-nights	Specimens trapped	Spotlight-hours	Specimens seen*	Number of Species Identified
Reconnaissance	Aug. 1967	—	—	—	15	2
Survey 1	Sept. 1967	81	4	17	40	10
Survey 2a	Oct. 1967	81	25	16	36	5
Survey 2b	Nov. 1968	81	15	16.2	34	6
Survey 3	Nov. 1967	62	6	15	37	7
TOTAL		305	50	64.2	162	17

*Includes daylight sightings.

results are given in Tables II and III. A systematic list of the mammal species encountered in the area is given in Table IV. Thirteen indigenous and four introduced species were recorded.

Notes on the Species Recorded

Specimens which have been retained are designated by their registration numbers in the collection of the Fisheries and Wildlife Department, Victoria.

Order MONOTREMATA

Family Tachyglossidæ

1. *Echidna*, *Tachyglossus aculeatus*

Although many diggings and scratchings indicative of *Echidna* were noticed, only two individuals were seen during the surveys. One Group member (D. Reeves) who lives at Riddell, reports having seen

not less than 40 *Echidna* in the district in the period 1964-1969. This species therefore appeared to be fairly common. No specimens were collected.

Family Ornithorhynchidæ

2. *Platypus*, *Ornithorhynchus anatinus*

The presence of this species in the area has been reported to us by several observers although none was seen during the survey period. Mr. H. Wheelwright recorded *Platypus* in Riddell's Creek below Yellowstone Farm in 1947, 1949, 1952 and 1954. Mr. G. Douglas, a Group member, reported a *Platypus* in Sandy Creek, near Ranoch Farm, in 1962 and Mr. A. John, a farmer of "Rocky Creek," reported *Platypus* in Riddell's Creek at Junction Hole in the spring of 1968.

TABLE III.

Apparent abundance of species (numbers seen or caught)

Species	Survey No.				Other Sightings
	1.	2a.	2b.	3.	
<i>Tachyglossus aculeatus</i>	1			1	See text
<i>Ornithorhynchus anatinus</i>					
<i>Antechinus stuartii</i>	1			1	
<i>Phascogale tapoatafa</i>					
<i>Sminthopsis crassicaudata</i>					2
<i>Petaurus breviceps</i>	3				8
<i>Pseudocheirus peregrinus</i>	17	32	15	26	2
<i>Trichosurus vulpecula</i>			1		7
<i>Phascolarctos cinereus</i>	8	6	12	9	10
<i>Wallabia bicolor</i>	1	1	3	4	1
<i>Macropus giganteus</i>	9				5
<i>Rattus fuscipes assimilis</i>		26	15	5	
<i>Rattus rattus</i>	3				
<i>Chalinolobus gouldii</i>		1			
<i>Oryctolagus cuniculus</i>	1		2	1	
<i>Lepus europaeus</i>					1
<i>Vulpes vulpes</i>	1				

TABLE IV.

Systematic list of mammals of the Riddell area

Order MONOTREMATA

Family Tachyglossidae

1. Echidna *Tachyglossus aculeatus* (Shaw)

Family Ornithorhynchidae

2. Platypus *Ornithorhynchus anatinus* (Shaw)

Order MARSUPIALIA

Family Dasyuridae

3. Brown Phascogale *Antechinus stuartii* MacLeay
 4. Tuan *Phascogale tapoatafa* (Meyer)
 5. Fat-tailed Dunnart *Sminthopsis crassicaudata* Gould

Family Phalangeridae

6. Sugar Glider *Petaurus breviceps* Waterhouse
 7. Ringtail Possum *Pseudocheirus peregrinus* (Boddaert)
 8. Brushtail Possum *Trichosurus vulpecula* (Kerr)
 9. Koala *Phascolarctos cinereus* (Goldfuss)

Family Macropodidae

10. Black Wallaby *Wallabia bicolor* (Desmarest)
 11. Grey Kangaroo *Macropus giganteus* Shaw

Order RODENTIA

Family Muridae

12. Bush Rat *Rattus fuscipes assimilis* (Waterhouse)
 13. Black Rat *Rattus rattus* (Linnaeus)

Order CHIROPTERA

Family Vespertilionidae

14. Gould's Wattled Bat *Chalinolobus gouldii* (Gray)

Order LAGOMORPHA

Family Leporidae

15. Rabbit *Oryctolagus cuniculus* (Linnaeus)
 16. Hare *Lepus europaeus* Pallas

Order CARNIVORA

Family Canidae

17. Fox *Vulpes vulpes* (Linnaeus)

Order MARSUPIALIA

Family Dasyuridae

3. Brown Phascogale, *Antechinus stuartii*

This species seemed to be uncommon in the area. Only two specimens were trapped, one near Conglomerate Creek and one south of Charlie's Creek, the latter a lactating female. Both were caught in rather open, dry, areas some distance from creeks in the spring of 1967. In addition, the mummified remains of a third specimen, associated with fox droppings, were found above Conglomerate Creek. However, most trapping took place during that period of the year at which population levels of *Antechinus stuartii* are at their lowest (Wakefield and Warneke 1967).

Specimens: Skin and skull: D.712♀, 24 Sept. 1967; skin and skeleton: D.708 unsexed, 24 Sept. 1967.

4. Tuan, *Phascogale tapoatafa*

One specimen, a young female, was found at the home of Mr. G. Douglas, at Riddell. Presumably it was killed by a cat. A second specimen was shot at a fowl-house in June 1969, within a mile of Riddell. The Fisheries and Wildlife Department has a specimen from New Gisborne (4 miles west of Riddell) and the Department also has records of the species from a number of localities in the Macedon area—Woodend, Lancefield and Romsey. It appears therefore that Tuans were widespread in the drier forest areas of the whole district. This species is rarely seen or trapped in the wild, most specimens being collected by cats or during tree felling.

Specimens: In spirit: D.856♀, 4 Jan. 1969; skin and skull, D.924♂, 23 Jun. 1969.

5. Fat-tailed Dunnart, *Sminthopsis crassicaudata*

Although this species was not encountered during the survey period, eight juveniles (4♂♂, 4♀♀) were collected in the vicinity of Clarkfield, four miles E.S.E. of Riddell, by J. Wombey, a former member of the Mammal Survey Group, in October 1962. This species might therefore also be found in the open farmland surrounding the township of Riddell.

Specimens: In spirit: D.473♂, D.480♀, D.482♀, D.483♂, 6 Oct. 1962.

Family Phalangeridae

6. Sugar Glider, *Petaurus breviceps*

This species was seen in only one area, on the south-eastern slopes of Mount Robertson, overlooking Conglomerate Creek. The animals seen were in Manna Gum (*Eucalyptus viminalis*) and Messmate (*E. obliqua*). The presence of Sugar Gliders in this area was indicated by the typically torn and scratched bark of stringybark eucalypts, caused by their search for grubs and other invertebrates. There are specimens in the Fisheries and Wildlife Department collection from New Gisborne (1966) and from Mount Macedon (1965) and it appears that while the local population may not be high, the species is probably widespread. Owing to its remarkable agility and often cryptic behaviour, this animal is not easily seen by spotlight and is seldom recorded during surveys. No specimens were collected.

7. Ringtail Possum, *Pseudocheirus peregrinus*

Ringtail Possums were apparently the most common phalangerids in the area. Large numbers (relative to the other species encountered) were seen in all areas investigated. Al-

though it is not possible to give an estimate of the population level, it may be presumed to have been high. The reason for this relatively high population in the survey areas is not known. Those animals seen were in a variety of trees including Messmate (*E. obliqua*), Manna Gum (*E. viminalis*), Peppermint (*E. radiata*), Silver Wattle (*Acacia dealbata*) and Black Wattle (*A. mearnsii*).

Specimens: Pick up skulls: P. 698 unsexed, P. 699 unsexed, 24 Sept. 1967.

8. Brushtail Possum, *Trichosurus vulpecula*

It is apparent from our survey records and the observations of local residents that Brushtail Possums were not common in the bush areas around Riddell but were more often encountered in the vicinity of the township itself. Only one animal was seen during the survey work, south of Mt. Charlie, in November 1968. However, up to seven have been seen along Riddell's Creek, mainly in introduced trees such as Hawthorn, Willow and Oak. Single individuals have been seen at other sites within the township. Road-killed Brushtail Possums have also been reported near Sunbury, some nine miles south-east of Riddell. No specimens were collected.

9. Koala, *Phascolarctos cinereus*

Relatively large numbers of Koala were observed in all areas examined and many other sightings in the general vicinity of Riddell are recorded in the Group's files. At least half the animals seen during the organised surveys were observed in daylight. In addition, the skeletal remains of four animals were found. Koalas were seen in Messmate (*E. obliqua*), Manna Gum (*E. viminalis*),

Narrow-leafed Peppermint (*E. radiata*), Silver-leaf Stringybark (*E. cephalocarpa*) and Mountain Grey Gum (*E. cypellocarpa*).

Specimens: Pick up skulls: K.179 unsexed, K.180 unsexed, 18 Nov. 1967.

Family Macropodidae

10. Black Wallaby, *Wallabia bicolor*

A few individuals were seen in each area investigated. Small numbers have been reported from the area by locally resident Group members. The species is apparently widespread in the hills above Riddell. Skeletal material identified as *Wallabia bicolor* was found on several occasions.

Specimens: Pick up skulls: MB.1904 unsexed, 24 Sept. 1967; MB.1942 unsexed, 21 Oct. 1967.

11. Grey Kangaroo, *Macropus giganteus*

Pairs and groups of animals were seen on four occasions in daylight and once at night. At one site, near Conglomerate Creek a small group of Grey Kangaroo has been seen regularly over the past few years by local residents. No specimens were collected.

Order RODENTIA

12. Bush-rat, *Rattus fuscipes assimilis*

With the exception of the area around Conglomerate Creek, close to farmland, where no Bush-rats were collected, this was apparently the most common ground mammal in the area. However, population levels appeared to vary within the areas trapped. At site 2, the number of Bush-rats caught was 3 to 5 times as great as at site 3 where there was much less ground cover.

Specimens: Skins & skulls: R.3220 ♂, R. 3221 ♀, R. 3222 ♀, R. 3223 ♀, R. 3224 ♂, R. 3225 ♀, 22 Oct. 1967.

13. Black-rat, *Rattus rattus*

This species was found only in the rocky gorge of Conglomerate Creek. Few animals were trapped and it seems probable that the close proximity of human habitation to this site had enabled *R. rattus* to spread and apparently to displace native rodents. No Bush-rats were trapped in this area and the only native mammal trapped was one *Antechinus stuartii*, a species which probably does not compete with *R. rattus*.

Specimens: Skins & Skulls: R.3205♀, R.3206 ♂, 24 Sept. 1967.

Order CHIROPTERA

Although many bats were seen in the area, only one was collected. The specialized techniques necessary to assess the numbers and species present were beyond the scope of this survey but there may have been several more species of Microchiroptera in the area.

Family Vespertilionidae

14. Gould's Wattled Bat, *Chalinolobus gouldii*

One of this species was shot on the wing just before dusk at site 2. A number of bats were seen in the vicinity.

Specimen: In spirit: ♀ 21 Oct. 1967.

Order LAGOMORPHA

Family Leporidae

15. Rabbit, *Oryctolagus cuniculus*

Few Rabbits were seen during the survey period and little sign of their presence was evident within the forest. Local control measures probably kept the population in check.

16. Hare, *Lepus europaeus*

There appeared to be a small population of Hares in the grassland around Riddell. One specimen was seen on the Riddell-Lancefield Road near Bolinda Creek in November 1968. The apparent low level of population may be due, in part, to local rabbit control measures.

Order CARNIVORA

Family Canidae

17. Fox, *Vulpes vulpes*

One Fox was seen near Conglomerate Creek in September 1967 and droppings were occasionally found, in one case in association with the mummified remains of an *Antechinus stuartii*.

DISCUSSION

Species present

This preliminary survey has established the presence in this area of thirteen native and four introduced species of wild mammal. Those most frequently encountered were the Ringtail Possum, Koala and Bush-rat, while Grey Kangaroo and Black Wallaby were less frequently seen. The smaller numbers of other species recorded might not adequately reflect their abundance as these are not as easily seen or caught, especially the Tuan and Sugar Glider. While it appeared that few Brushtail Possums lived in the forested area, they were quite common in the settled areas south of Riddell's Creek, towards Sunbury.

Ringtail Possums were very common in the area, much more common than in any other area surveyed by the Group, excepting only the vicinity of the Yarra River in Melbourne. No explanation can be offered for this abundance.

There was also a flourishing Koala population. This species occurs naturally here and, as Koalas are known

to move over quite large distances, the local population might have been influenced by animals that have been released in the district by the Fisheries and Wildlife Department over the years. Records of that Department show that six animals were released near Macedon in May 1931, twenty-five at Toolern Vale in November 1943, forty-six in the Black Forest in November 1952 and twenty-three at Hanging Rock in June 1957.

Had the survey programme been prolonged or extended into other parts of the hills, other species, not recorded in these surveys, might have been found.

Previous records of mammals

A useful though incomplete record of the mammals occurring in the region between 1846 and 1900 has been given by Batey (1907). From this account it is possible to see some of the changes that have resulted from 125 years of European occupation.

Batey lists the following mammals present—

Water-rat, Dingo, Tuan, Fat-tailed Dunnart, Swainson's Phascogale, Quoll, Tiger-cat, Bandicoot (species not indicated but probably *Isodon obesulus*), Koala, Brushtail Possum, Ringtail Possum, Sugar Glider, Greater Glider, Wombat, Platypus, kangaroo and wallaby. Of these, four species, Dingo, Quoll, Tiger-cat and Bandicoot were reported to be extinct, or nearly so, in the area prior to 1907. Tuan, Swainson's Phascogale, Sugar Glider, Ringtail Possum, Greater Glider, kangaroo and wallaby were listed as uncommon, while only the Water-rat, Wombat, Platypus and Brushtail Possum were considered common, although the latter species underwent considerable population variation due to hunting by man. Batey stated that "owing

probably to the visits of the Aborigines, this animal was not plentiful in the early days, but when they ceased to visit the district, about 1851, Opossums became numerous. Later, when the demand for their skins set in, they became nearly extinct. Of late years they have again increased . . ."

The present survey did not encounter eight of the species listed by Batey — Water-rat, Dingo, Quoll, Tiger-cat, Bandicoot, Swainson's Phascogale, Greater Glider and Wombat. The last three species are known to occur around Mt. Macedon at present, outside the area of this survey, but the first four probably no longer exist here. It is strange that Batey did not record *Echidna* for this species is now apparently common in the district.

Nature of the habitat

Detailed examination of the vegetation showed that a great variety of plant species was present in the hill country, although the vegetation pattern has been considerably altered since white settlement. J. Frankenberg (personal communication), considers that changes in the forest have been more in structure than in composition. Timber extraction and clearing for farmland have altered the overall tree height and density and that of the undergrowth, and have produced a characteristic young forest. However, the forest still supports a wide variety of arboreal mammals, unlike the superficially similar northern end of the Lerderdurg Valley, where recent surveys have shown a very sparse population. This variation is possibly due to the lack of intensive forest management in the Riddell hill country compared with that in the Lerderdurg Valley. The variety and numbers of mammals encountered in the

Riddell hills show that this habitat is such that it has enabled a relatively rich fauna to survive.

The effects of drought

Quite large differences are evident in the numbers of certain species recorded at the beginning of the drought in October 1967 and late in the following spring, in the results of surveys 2a and 2b. Approximately half as many Ringtail Possums and Bush-rats and twice as many Koala were recorded after the drought as before. However, in order to assess the significance of these differences it is necessary to know what seasonal variation in apparent numbers can be expected in normal conditions and how accurate our survey methods are. As we have no data on the normal variation in numbers of the species reported in these surveys it is difficult to attach significance to the differences seen.

In addition, the interpretation of the quantitative results of these surveys suffers a further handicap in that the "efficiency" of both spotlighting and trapping methods (that is, the accuracy with which these techniques sample the actual population of animals) is not known and must certainly differ for different species. The lower this efficiency, the less sensitive are such techniques in detecting a change in population. Thus, it is not at present possible to deduce from the differences found, what changes in true population had occurred. The drought certainly did not appear to have such severe effect on the animal population that it could not easily recover.

Comment

The pressure of peri-urban residential development is now being felt in this area as a result especially of the building of Tullamarine Air-

port. The evidence gathered in these preliminary surveys is sufficient to warrant serious consideration being given to retaining at least a substantial portion of the area as a faunal reserve. While none of the thirteen native species recorded in this survey is unique to the area or, indeed, is particularly uncommon elsewhere in the State, their continued presence so close to Melbourne will depend only on the provision of some form of protection.

Acknowledgements

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APPENDIX

Detailed description of the vegetation of the areas selected for sample surveys

(For these descriptions we are greatly indebted to Judith Frankenberg, D. Ashton and N. Scarlett).

Survey 1:

The vegetation here was open forest predominantly of *Eucalyptus obliqua*, 50 ft. high on the lower slopes and 30-40 ft. on the ridges, accompanied by *E. dives* on the upper slopes and *E. viminalis* on the lower. The forest had been heavily cut in the past and was of uneven age, with frequent gaps. It was last burnt in 1962 and had a sparse shrub layer, largely comprised of saplings of *Acacia mearnsii* with occasional *A. verticillata* and small, heavily grazed *Bursaria spinosa* and *Pultenaea daphnoides*. Trees of *A. mearnsii*, 30 ft. high, were scattered along the creek bed. The ground surface was stony with frequent rock outcrops. The ground cover was grassy, dominated by *Poa australis*, with numerous herbs, scattered *Pteridium esculentum* and occasional clumps of *Gahnia radula*. On the western aspect the ground cover was nearly 80% but was much more sparse on the east-facing slopes.

Surveys 2a and 2b:

The vegetation of this area can be divided into three categories; the creek banks and adjacent flats, the

hill slopes of southerly aspect and those of northerly aspect.

The creek bank and flats carried a layered open forest (up to 100 ft. in height) of *E. viminalis* and *E. obliqua* with occasional *E. radiata*. A low tree layer (to 40 ft.) of *A. dealbata* and *A. melanoxylon* was present beneath the eucalypt canopy, with a dense tall shrub layer (to 15 ft.) dominated by *Pomaderris racemosa* and *Acacia verticillata*. Shrubs such as *Pultenaea angustifolia* and *Bursaria spinosa* were occasional components of the tall shrub stratum. The ground stratum was dominated by dense tussocks of *Poa australis*, associated with species such as *Asperula scoparia*, *Hydrocotyle hirta*, *Viola hederacea*, *Acaena anserinifolia*, and *Adiantum aethiopicum*. *Pteridium esculentum*, *Blechnum nudum* and species of *Gahnia* and *Lepidosperma* formed a field layer in some areas. Climbing plants commonly extended from the ground stratum into the tall shrub canopy, the most prominent of these being *Tetrarrhena juncea* and *Clematis aristata*. Near the banks of the creek the ground stratum differed slightly, with such species as *Mentha* sp., *Senecio australis* and *Lomandra longifolia* becoming more prominent.

The hillsides of southerly aspect were covered, on the lower slopes,

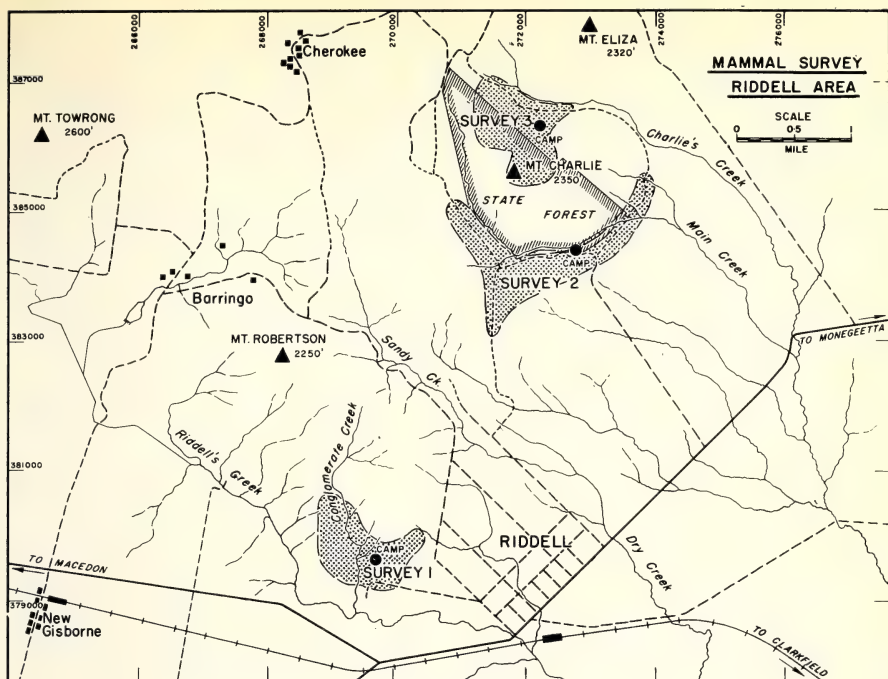


Fig. 1.

by grassy, open forest of *E. obliqua* and *E. radiata* with occasional *E. viminalis* growing to 60-70 ft. The ground stratum contained grasses and dicotyledenous herbs with a discontinuous field layer of *Pteridium esculentum*.

It was dominated by tussocks of *Poa australis* associated with plants such as *Viola hederacea*, *Dichopogon strictus*, *Asperula scoparia*, *Geranium pilosum*, *Lagenophora stipitata*, *Adiantum aethiopicum* and infrequently, *Danthonia pallida*. On the upper slopes the forest consisted of *E. obliqua*, *E. radiata* and *E. cephalocarpa* reaching a height of 50-60 ft. In the open shrub layer (6-8 ft.), *Xanthorrhoea australis* was associated with scattered, medium to low shrubs, mainly *Acrotriche serrulata*, *A. prostrata* and *Daviesia corymbosa*, with rare occurrence of *Bankisia marginata* and *Hakea sericea*. The ground was dominated by tus-

socks of *Danthonia pallida* and *Poa australis*, with other smaller shrubs such as *Drosera auriculata*, *Opercularia varia*, *Lomandra filiformis* and *Veronica calycina*. *Pteridium esculentum* was occasional over the whole area.

The hillsides of northerly aspect carried, on their lower slopes, layered woodland and open forest (50-60 ft. high) of *E. obliqua* and *E. cephalocarpa* with occasional *E. radiata* and *E. dives*. The understorey of this community was variable in density. On some sites there was a dense tall shrub layer (to 10 ft. in height) of *Hakea sericea* with a low shrub layer of sclerophyllous shrubs such as *Achrotriche serrulata*, *Epacris impressa* and *Platylobium formosum*, associated with tussock grasses and other herbaceous plants. On other sites the shrub stratum was less dense and herbaceous plants correspondingly denser. The herbaceous

stratum on these slopes were very similar to that of the *E. obliqua*-*E. radiata*-*E. cephalocarpa* association on the middle and upper slopes of southerly aspect.

There was a gradual change from the lower to the upper slopes, the latter carrying a sclerophyll woodland of *E. dives* and *E. cephalocarpa* to a height of 35 to more than 50 ft., with a medium shrub layer (4-5 ft.) of *Hakea sericea* and *Banksia marginata*. Low shrubs were prominent and included *Xanthorrhoea australis*, *Pultenaea humilis*, *P. gunni*, *Epacris impressa*, *Hovea heterophylla* and *Platylobium formosum*. The herbaceous stratum was dominated by *Danthonia pallida* and scattered *Poa australis* and was often well developed (up to 70% cover). Associated herbs included *Haloragis tetragyna*, *Drosera auriculata*, *Lomandra longifolia* aff. and *Craspedia uniflora*.

A comprehensive species list with

its ecological associations for this site is lodged in the Mammal Survey Group records.

Survey 3:

The vegetation of this area, on the northern slopes of Mt. Charlie, was very different from that of both previous surveys. Here the forest was, for the most part, very sparse *E. obliqua* with less than 1% canopy cover. There were a few thickets of very young *Acacia dealbata* (to 8 ft.) many *Xanthorrhoea australis* (some in seed) and some *Pteridium esculentum*. Ground cover was sparse (less than 5%) consisting of scattered small tussocks of dry grass and occasional clumps of sedge. The area had been severely burnt 2 years previously. The forest became more dense on the upper rocky slopes (the northern face of Mt. Charlie) with correspondingly thinner ground cover.

An Unusual Bridge Support

by MARY TURNER SHAW

About 1848 a bridge was built over the Mount Emu Creek, in the Western District, its timbers being carried in the wide fork of a large river red gum. It was probably built mainly for the Rev. William Hamilton, first Minister of "the Western Church" (for a time the only church between Colac and Warrnambool, but long since crumbled and gone), so that he could easily ride across to the far reaches of his enormous parish. It also served the nearby homestead of the station which lay on both sides of the creek. Von Guerard's drawing of it is dated 1857.

In my own childhood, before the first World War, the bridge was still in daily use. My father, I remember, had it re-timbered, and at that time the two grey, iron-hard ends of

the branched trunk were sawn back further, and rather inelegantly sheeted with iron to keep out rain and decay.

In 1939 a bad bush-fire which destroyed many of the older station buildings also burnt out the bridge. Revisiting my one-time home in March of this year—1970—I found only the broad, charred stump of the great old tree remaining, but marvelled to see that from its base have sprung long, thin branches, tufted with green leaves.

I do not know what is the life expectancy of a river red gum, but surely this is an unusual example of toughness and longevity; possibly even a happy augury for the continued survival of nature over the various assaults of man.

Konstantin Cyril Halafoff

The death on 24 April, 1969 of Konstantin Cyril Halafoff brought an end to the career of one of our most colourful and gifted personalities. There are not many who, in the course of a lifetime, have encompassed so many varied activities and achievements.

As we knew him in this country during the past fifteen years, he was a kindly man who gave the impression of having only two principal interests in life, namely, to protect the lyrebird and to seek peace in the solitude of the forest. Perhaps these interests were a form of distracting behaviour, because his early training and interests lay in very different spheres.

K. C. Halafoff was born on 2 April, 1902 in Moscow and may be said to have belonged to the Russian liberal intelligentsia. Following teaching by private tutors he went on to high school, whilst taking private tuition in the piano. It was his early intention to become a concert pianist and a composer. Even as a teenager, he had some poetry published.

But fate was shaping his destiny in a different mould and, at the age of 17, he joined the White Russian Army in its fight against the Bolsheviks. After the defeat of the White Russians he was evacuated to Constantinople and later to Yugoslavia.

Here life began anew, and he started high school at the age of twenty. From high school he went on to the University of Belgrade, where in 1931 he graduated with honours in Civil Engineering. He was retained by the University as an Assistant Professor. Here he met and married a student in architecture who was also a Russian of White Army background.

His interests linked him with Russian emigre anti-communist organizations, but he found time to write a number of poems which were published.

Perhaps the added responsibilities of marriage caused a minor pause in his wide-ranging interests and he joined the Yugoslavian Government Railways where he was employed from 1932 to 1939 as a structural design engineer. In this capacity he became one of the country's experts on steel bridge construction.

He had left Russia nearly twenty years earlier in quest of peace, but in 1939 was again enmeshed in the web of fate. He joined the Yugoslav army in its war with Germany. Before long, alas, he was in the hands of the Germans, who sought to utilize his professional skills as an engineer. He was moved towards the Hungarian border, but as the Soviet Army advanced through the Balkans, he decided to endeavour to get away even at the risk of German forced labour camps, lest he fall into the hands of the Russians, for fear that his anti-Soviet activities might be too well remembered. His aim was eventually to reach the British- or American-occupied area.

He joined a refugee train bound for Austria . . . and somehow managed to take his family with him. When his disappearance was discovered, he was sentenced to be shot by the Germans for desertion; but, with the ingenuity of a Scarlet Pimpernel, managed to avoid identification in the chaos of the German forced labour camps in Austria. He was eventually "liberated" by the Americans, but not before he had made another escape from the

advancing Soviet Army, this time on foot in the middle of Winter.

So this Russian who had established himself in Yugoslavia now entered a new phase of his life and, after studying English in a Displaced Persons' Camp, became an interpreter to British and American missions in a Resettlement Camp in West Germany.

In 1949 he migrated to Australia with his family and, until his retirement 18 years later, was employed by the Country Roads Board as a design engineer in the Bridge Division. During this period he was associated with the design of many road bridges throughout Victoria and, in particular, the strengthening of the Chandler Highway Bridge over the Yarra River and the Glenelg River Bridge at Nelson.

Happily, his wife, who was a qualified architect, was also employed by the Board which was thus enabled to play an important part in the further development of this talented husband-and-wife partnership.

Freed from the stresses and strains to which he had been subjected in Europe, he now entered a new phase of his life which was perhaps his most rewarding and happiest period. It almost seemed as if, all his life, he had been searching for truth, and he found inspiration among the tall mountain ash and fern gullies of Sherbrooke Forest. His love of peace and his early training as a musician, his fine feelings as a poet, and the anguish of the years before, had conditioned him for a warm spiritual response to the charms of Sherbrooke. Before long he had met and, in his own words, fallen in love with Sherbrooke's lyrebirds. As the years passed, he became greatly attached

to "Spotty," without doubt, Sherbrooke's most celebrated lyrebird.

But K. C. Halafoff was not content merely to observe, however enjoyable he found this experience. Before long, his fertile, highly trained mind was asking questions about the nature of the lyrebird's song and he began to apply in a most ingenious manner his training as a musician and engineer to the analysis of the lyrebird's song. His researches on this subject were penetrating and covered a wide field, and brought a harvest of scientific papers on this subject which will always stand as a monument to his brilliant intellect. He did not work in a vacuum and, in the course of his researches, collaborated with the world's leaders in the field of bird-song analysis, thereby focusing the attention of overseas scientists on the lyrebird—Australia's No. 1 songbird.

His publications in the Victorian Naturalist dealing with this subject comprise a heritage of scientific achievement in a virgin field, for none had attempted this work previously. As he says in one of his papers, it was fortunate "that a full realization of the musical value of bird song and subsequent attempt to analyse its musical properties have come so late—on the heels of magnetic tape and electronic devices which only recently have made it possible to record authentic bird song with all its minute details — tremolos, rapid glissandos, trills and other adornments in which it abounds. Had that analytic work started earlier, on the basis of field notes, all of it would have had to be scrapped now." Whilst agreeing, we can also add, how fortunate it was for us all that K. C. Halafoff "happened along" at the right mom-

ent and realised that there was an opportunity for scientific study in what to others had been a transient interest.

Among his other interests was the making of a movie film on the lyrebird, in colour, a task of no small magnitude for him, depending as he did on natural light in a dense forest. In this work, too, he displayed typical pertinacity and produced an excellent film which won acclaim at home and abroad. He also collaborated with Mr. Peter Bruce in the making of a record of the lyrebird's song, which was produced in the United States.

But Halafoff will be remembered not only for his scientific achievements. Everybody who has read his papers, and especially the one entitled "Lyrebirds of Sherbrooke" (Vic. Nat., March 1958, Vol. 74, p. 157) will have been moved by his mastery of the English language. He played it as he would his beloved piano and the result is a treasury of English literature. He had the sensitivity to hear the inner voice of the forest and the talent to interpret its message and convey it to his fellow men.

Unfortunately, failing health forced his retirement in 1967, but his intel-

lect never faltered and he turned to a number of musical compositions, mainly a suite dedicated to J. R. R. Tolkien, based on the latter's trilogy "the Lord of the Rings." He finally succumbed to a heart attack in April, 1969.

K. C. Halafoff has gone, but his good works remain for posterity and us. No longer will he be seen quietly sitting on a fallen monarch in Sherbrooke Forest, listening intently to the song of the forest, nor will he be heard urging his fellow men to greater efforts to preserve his precious lyrebirds; but the memories of these events will not soon fade.

Those who knew him will remember him as a vigorous champion of the weaker elements of society and nature which stood in need of protection and as a kindly man whose anger was roused only by some unkind act against those things which could not protect themselves. His scientific works, his poetry, his literature and his example are a valued part of our heritage. He was never content to give anything but his best and his best was superlatively good. Truly, it may be said that Konstantin Cyril Halafoff did not live in vain.

L. H. SMITH

Geology Group Excursions

Sunday, 5 July—To Cave Hill (Lilydale) Limestone Quarry. Leader: Mr. J. Dobson.

Sunday, 9 August—To Heathcote. Leader: Mr. R. Davidson.

Saturday, 5 September—To Eden Park Fossil beds. Leader: Mr. Barry Cooper.
Leave Lalor Railway Station at 2.10 p.m.

Sunday, 11 October—M.M.B.W. Trunk Sewer Tunnel. Leader: Mr. Kerry Hammond. Limited to party of 20—booked out. No further applications can be accepted.

Sunday, 8 November—King Lake. Leader: Mr. George Carlos.

Transport is by private car (spare seats are usually available to those without their own transport). **Unless otherwise indicated** excursions leave from the western end of Flinders Street Station opposite the C.T.A. Building at 9.30 a.m.

Field Naturalists Club of Victoria

General Meeting

8 June, 1970

The meeting was opened by Mr. T. Sault, the President, with approximately 120 members and visitors present. A welcome was extended to new members, particularly Mr. and Mrs. R. Garrett, from South Australia, who were present.

Mr. Sault informed the meeting that the Public Address system had been overhauled and invited comment from the audience as to whether the acoustics were improved. Sound tests conducted in the Hall will be referred to the Council for further consideration.

Exhibits:

A varied selection was tabled and created interest and discussion.

Mr. T. Sault—A brown variety of Common Vegetable Bug (*Nezara viridula*), 2 ground-dwelling spiders common to the Mornington Peninsula (unidentified), a specimen of the Twiggy Daisy-Bush (*Olearia ramulosa*) found growing in sand at Gunnamatta Beach, and under the microscope fossil shells (Foraminifera) from Balcombe Bay.

Mr. Barry Cooper — Fossil shells (Brachiopods) in Devonian rocks collected at Grants Road, near Woodstock, Victoria.

Mrs. North—A collection of polished agates from Lymington Beach, Cygnet, Tasmania.

Mr. Haase—A garden grown N.S.W. Waratah (*Telopea speciosissima*).

Mr. R. McGavin—A Fungus (*Tricholoma spp.*) from the Lower Kinglake area.

Mr. D. McInnes—A specimen of basalt showing zeolite crystals, collected on the geology excursion to the Footscray Quarry. He suggested that an effort be made to preserve some of the cliff faces in the quarry because of their geological value. They would eventually be lost as the quarry was now being filled with rubbish. A species of rush (*Juncus acuta*) found growing in polluted water in the quarry was also shown.

Mr. Swaby—A selection of native flora and 2 specimens—Austral Adders-Tongue (*Ophioglossum coriaceum*) and Onion Orchid (*Microtis orbicularis*), collected and preserved in 1935.

Mr. T. Sault and Mr. D. Lee were elected as F.N.C.V. delegates to attend the meeting of the Conservation Council of Victoria to be held at the Redmond Barry Building, Melbourne University on the 18th June, 1970. A motion was passed that the F.N.C.V. become a full member of the Conservation Council and the necessary fees be paid.

Mr. P. Kelly, Club Librarian, spoke on the need for more space in the Library and suggested that a number of obsolete books be removed. It was decided that a Council sub-committee be formed to select those books to be discarded, the list to be placed before the general meeting for approval.

A storage problem had also arisen regarding photographic blocks and members were asked if they could assist with space and indexing.

On behalf of the Botany Group, the President, Mr. A. Fairhall, presented a copy of Nichols "Orchids of Australia" to the Library in memory of the late Mr. Frank Zirkler.

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The subject for the evening was a film, "The Turn of the Tide" produced and presented by Mr. Ian G. Wallis, of Monash University. Mr. Wallis also spoke on the work of the Monash University Westernport Bay Research Team and outlined ways in which club members could assist with this important project.

A resume of Mr. Wallis' talk will be published as a separate article in August.

Botany Group Meeting

11 June, 1970

The subject for the evening was entitled "The Botany of Captain Cook's Australian Voyage."

Mr. J. Baines had prepared a detailed set of maps and charts, showing the places named during the voyage along the Eastern Australian coast and the places where the party landed and collected botanical specimens. As well as the charts, there was a list with the up-to-date names of the plants collected at Botany Bay. Each person at the meeting was presented with a copy of this list. The voyage further north, through the more tropical parts of Queensland was mentioned in less detail.

Cook, at some sacrifice to the comfort of his ship's personnel, had allowed Banks to join the expedition with his team of botanical workers. To equip and finance this group, Joseph Banks had used his own private means. The lecturer described the life of Banks and various members of his team of workers, dwelling especially on the life of the able Swedish botanist, Solander.

There were some extremely interesting books on view, some lent by the Herbarium Library, some from Mr. Baines' own collection.

Though Banks and Solander described the plants collected, it was later botanists who published descriptions. Hence many of the names given by these first collectors have been changed.

Several of the books contained the beautiful botanical drawings of Parkinson, whose sketches were finished, after his death on the voyage, by four other botanical artists.

The chairman thanked Mr. Baines for his unusual talk, which must have entailed an immense amount of detailed reading and research.

Geology Report

6 May, 1970

Thirteen members attended with Mr. Blackburn in the Chair. The subject for the evening was a talk by Mr. Kerry Hammond on "Basin Evolution." The speaker began by explaining that his talk was on the mechanism of Structural Geology and its relation to oil formations.

The formations of Dynamic basins, he said, resulted from a different structural mechanism to Orogenic basins such as geo-synclinal troughs, which as a rule are not oil bearing. His mention of the fact that oil basins are not concave, but convex caused considerable interest and he explained through the aid of diagrams why this is so. He then explained that when oil is occupying pore space in very porous rocks, it migrates under pressure from areas of high stress to areas of low stress which are usually on the margins of the basin. He also said that one of the present popular theories on the cause of basin structure was convection currents caused by radioactive elements deep in the earth's crust dragging down the earth's crust at regular intervals. He said that no basin or fold structure anywhere on the globe exceeded 35,000 ft. This seems to be the physical limit of any structural system. He quoted an area in the South China seas where an oil basin is at present in the process of forming. Mr. Blackburn thanked Mr. Hammond for a very interesting and informative talk.

Exhibits.

Mr. Angior—Granite with Tourmaline Crystals, Wilsons Promontory.

Mr. McInnes—Bryozoal limestone, Waurin Ponds, under microscope. Brachiopods, Waurin Ponds.

Mr. Blackburn—Fossil Kangaroo Jaw, Fossil bone fragments, Aboriginal artifacts, and Chippings. Greens Gully, Keilor.

Mr. Sault — Hypersthene-Rhyodacite, Barnewall High Plains. Cordierite-Nevadite, Eildon. Basalt, Eildon. Stibnite in Quartz, Eildon.

Marine Biology and Entomology Group

4 May, 1970

Mr. R. Condron chaired the meeting which was attended by 19 mem-

bers. An apology was received from Mr. and Mrs. Lee.

The Secretary reported that he had spoken to the Secretary of the club, Mr. D. Lee, re the taking of marine life from Ricketts Point, and that Mr. Lee had said that he would take the matter up with the local council of that area, with a view to having notices put up.

Mr. W. McInnes reported that a meeting of the Show Committee was held recently. Unfortunately Mrs. G. Lee was unable to attend.

Dr. Brian Smith will be in Queensland during the Show period, but will arrange with the Underwater Research Group to put on a display similar to that of last year. A suggestion was made that a special feature be made of land and freshwater molluscs. Mr. David Long will be able to arrange this.

The secretary read a letter from Dr. Brian Smith stating that a census of land and freshwater molluscs of Victoria was to be undertaken as a joint project between the Museum, the F.W.C.V. and various other naturalists' clubs throughout the State. Dr. Brian Smith gave a short talk on this project, stating that Mr. D. Long had been involved in a similar project in England and Ireland. He also suggested that on future outings each member be given a plastic bag or collecting bottle, and whilst engaged in other nature activities, keep a lookout for land molluscs. Necessary data re collecting details will be distributed at a future date.

Mr. McInnes suggested that one specimen of land or freshwater mollusc could be described in the F.W.C.V. Journal monthly, in order to keep the matter before the notice

of members. Dr. Smith asked for assistance in keeping a record of molluscs collected. Mr. J. Strong offered to assist.

At the April Group meeting Mr. R. Condron was nominated as Chairman of the Group for the ensuing year, and Mr. J. Strong as Secretary. As there were no further nominations the above were declared duly elected.

Dr. Brian Smith announced that the next work-in at the Museum would be on Saturday, 16th May, starting at 10.30 a.m.

The secretary announced that Mrs. Zillah Lee had very kindly offered to keep the minutes while he was away for three months.

Exhibits.

Mrs. C. McInnes—some mealy bugs on fronds of a fern.

Mr. R. Condron—a drawer of butterflies of the sub-family Danainae. Mr. Condron stated that the Wanderer was a member of this family, and that this family could be traced through the Indo-Malayan region.

Miss E. Dixon—a beetle which was identified by Mr. P. Kelly as *Diaphonia dorsalis*. This specimen was taken at Northcote.

Mr. P. Kelly—a spider, *Celaenia excavata*. This spider is commonly known as the Bird-dropping Spider.

Miss L. White—Saw-fly larvae showing variation of colour.

Mr. J. Strong—a land mollusc—one of the black snails, *Victaphanta atramentaria*, collected at Powelltown. Also two small species of snails collected at Murrumbidgee. Some leaf-hoppers—black with red markings on them. These were also collected at Powelltown, and were attended by ants.

Notice to Contributors

In order that editing time be kept to a minimum, articles should be preferably typewritten and double-spaced; with a 1" margin on the right. No underlining should be shown.

If handwritten, please allow a margin of 1" and write clearly.

Western Victoria Field Naturalists Clubs Association

Report on Club Activities for year 1969

(Compiled by J. Lineker, Hon. Secretary, Portland F.N.C.)

Reports from other Clubs will appear next month.

GEELONG

President: Mr. J. Wheeler. Secretary: Mr. Gordon McCarthy.

Membership 400 members and subscribers. *Meets First Tuesday, McPhillimry Hall.*

Enthusiastic meetings have been held throughout the year with Junior Meetings held prior to the general meeting. Prizes for the junior projects were awarded at the end of the year. All meetings have been well attended, with 155 members and visitors in December, and a variety of speakers and subjects have been of great interest. A diversity of areas were visited on the monthly excursions, averaging 40-50 cars; and two weekend excursions to Mt. Macedon and Portland were very well patronised. A nature show was held at Freshwater Creek hall for that branch of the Victorian Farmers Union. Some 120 boys from Haileybury College, staying at Anglesea National Fitness Centre were taken on a geology excursion and given a nature evening. A number of Lady Cub Masters at Eumeralla scout camp were similarly entertained.

Tree planting in conjunction with the B.O.C. was carried out at the You Yangs and Serendip Wildlife Station. The club has joined with the local branch of the SGAP to try to reserve 200 acres of bush at Bannockburn. A survey group, by a series of 2-monthly campouts, will study areas in the Otway Ranges with a view to reservation. The high standard of the quarterly magazine *The Geelong Naturalist* has been maintained and it continues to be most popular.

HAMILTON

President: Mr. Murray Gunn. Secretary: Mr. John James.

Membership: Adults 35, Junior 4. *Meets Third Thursday, Gray St. State School.*

The Club has purchased a cabinet for the herbarium, and now has 705 different species of plants filed. Mr. Cliff Beaglehole has presented many specimens and given a detailed index. During the Yulunga Festival in February the Club sponsored a natural history lecture. An exhibit of native flowers grown in members' gardens was sent to the Nature Show in Melbourne. Approximately 180 trees supplied by the Fisheries and Wildlife Department have been planted by club members at Bryans Swamp.

HORSHAM

President: Mr. C. O. Kroker. Secretary: Miss S. Robertson.

Membership 40. *Meets Fourth Thursday, Technical School.*

Meetings have been well attended, and natural history specimens are a regular feature. The 7-minute free choice subject talks indicate the high standard of member participation. The club has organised a yearly essay competition for Horsham Primary Schools to stimulate interest in nature study. Monthly speakers included Microbiology by Mr. R. Luff of Longerenong Agricul. College. Slide lectures 'Birds identified on a trip to Cent. Aust.' Mr. Gunn, Hamilton F.N.C. 'Birds around the world' Mr. R. Cooper, RAOU; Audio-visual 'Frogs of the Horsham District' Mr. Con Kroker, and Nature Slide Project, Mr. Schick, Horsham. Member nights, question night and screening of nature films were included in our syllabus. Excursions included fungi collection at Troopers Ck. (Gramplains), inspection of the Wimmera R. in Horsham conducted by the club representative on W.R. Improvement Committee, Mrs. Jean Hill. An inspection of a swampy scrub area known as 'Nowhere Else' near Carpolac resulted in a recommendation for preservation to the Fisheries and Wildlife Dept. Another area of scrub land adjacent to the reserve forest in the Parish of Tooan was also inspected with a view to preservation. Conservation has received active support particularly the Little Desert, Lower Glenelg, and Arapiles. Negotiations with the Arapiles Shire Council for assistance in clearing the fence will push forward the project for fencing the John Smith Memorial Sanctuary.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.

Patron:

His Excellency Major-General Sir ROHAN DELACOMBE, K.B.E., C.B., D.S.O.

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Microscopical: Mr. M. H. MEYER, 36 Milroy Street, East Brighton (96 3268).

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Entomology and Marine Biology: Mr. J. W. H. STRONG, Flat 11, "Palm Court", 1160 Dandenong Rd., Murrumbeena 3163 (56 2271).

Geology: Mr. T. SAULT.

MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available, and other activities are indicated in reports set out in the several preceding pages of this magazine.

Rates of Subscriptions for 1970

Ordinary Members	.....	\$7.00
Country Members	.....	\$5.00
Joint Members	.....	\$2.00
Junior Members	.....	\$2.00
Junior Members receiving Vict. Nat.	.....	\$4.00
Subscribers to Vict. Nat.	.....	\$5.00
Affiliated Societies	.....	\$7.00
Life Membership (reducing after 20 years)	.....	\$140.00

The cost of individual copies of the **Vict. Nat.** will be 45 cents.

All subscriptions should be made payable to the Field Naturalists Club of Victoria, and posted to the Subscription Secretary.



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Wild Flower and Nature Show

Where? The Lower Melbourne Town Hall.

When? Monday, Tuesday and Wednesday, 13, 14 and 15 September, from 10 a.m. to 10 p.m.

The above Show is prepared and staged annually by the Society for growing Australian Plants (S.G.A.P.), and by the Field Naturalists Club of Victoria (F.N.C.V.).

Through this comprehensive exhibition we hope to create in the general public a greater awareness of the wealth of interest and enjoyment to be gained from a knowledge of our remaining bushland and beaches, and a greater concern to preserve as much as possible of what remains both for the present and for the future.

To this end the Bird Observers Club is staging, as the main exhibit, two dioramas depicting —

(a) birds in their natural habitat, and

(b) what can happen to them in a polluted environment.

The 1970 pamphlet will tell the story of the Fairy Penguins of Phillip Island fame.

The wild flowers, from all Australian States, displayed by the S.G.A.P., are all garden grown, and these successful growers will be very happy to pass on any hints on their culture and availability to any "would-be" growers.

Another colourful exhibit will be a display of native flowers from the Maranoa Gardens, Balwyn.

The Hawthorn Junior Field Naturalists are again showing how varied their interests are. One exhibit features "Fossils found around Melbourne," and another will show minerals under fluorescent lighting, while a third is an Ant Farm. A fourth activity will demonstrate methods used in collecting pond-life.

The Entomological and Marine-life Group will display pond-life in aquarium tanks.

The Preston and Montmorency Junior Field Naturalists are also preparing exhibits.

Captain Cook's voyage along the Eastern coast of Australia in 1770 has provided the themes for both the Botany and the Geology Groups. The former is featuring plants collected by Sir Joseph Banks (then Mr. Joseph Banks), and by Dr. Solander. Some reproductions of illustrations begun by Sydney Parkinson will also be shown.

The members of the Microscopical Group will bring to our notice some of the very interesting things we cannot see with the unaided eye. They will also show methods used in preparing plant exhibits for examination, as well as views of microscopical objects projected on a screen.

As usual one of the exhibits — popular with children — will be live snakes, lizards and frogs.

Last, but not least, from the children's viewpoint, will be the frequent free showing of Nature Films kindly lent by the State Film Centre.

Books and publications on natural history subjects will be available for sale on a Publications Stand. Here one may also obtain information relative to the F.N.C.V.

ADMISSION — Children 10 cents, Adults 30 cents.

Continued p. 242

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Front Cover:

How many of us are familiar with the reptiles of Victoria? The gecko shown here is the forerunner of an illustrated series by Hans Beste, which is to be published soon.

August, 1970

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A Blue Bottle in the Sub-Antarctic

by

WILLIAM MERILEES*

Half the enjoyment gained from walking the tide line is the anticipation of what will turn up. Even when I was stationed in the sub-antarctic at Macquarie Island in 1967, this fascination provided great enjoyment, although the accumulated flotsam had nowhere near the variety of an Australian shore. Pumice, from the South Sandwich Island volcanic

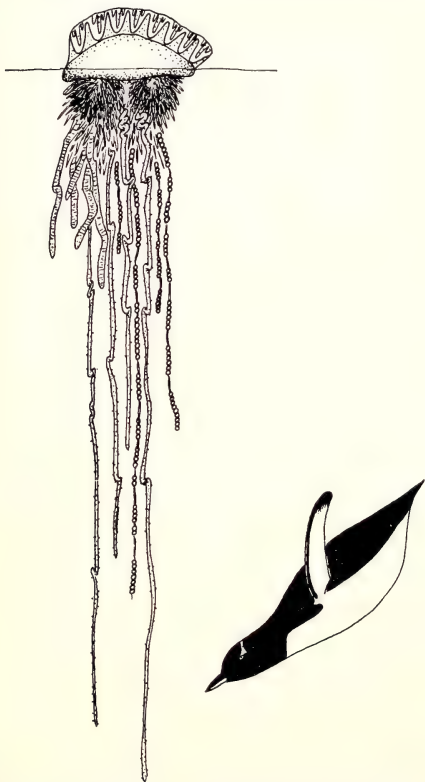
eruption in 1962, was everywhere; large glass buoys from Japanese pelagic fishing operations were picked up on occasion, even one metal navigation buoy from the African coast was located. Aside from these were the usual assortment of seaweeds; red, brown and green, and many other marine organisms, notably molluscs and fish and a few large crustaceans. One of the most unexpected finds was one Blue Bottle or Portuguese Man o' War *Physalia utriculus*.

During my exploration of Australian beaches, primarily those near Wollongong, New South Wales, many hundreds of Blue Bottles were found beach-washed and brittle. Having spent much of my earlier beach-combing on Canada's West Coast, I was somewhat surprised by this occurrence as I had always considered this species to have a much more tropical distribution. I suppose this was just another of those misconceptions which plague a foreign student of biology who has not been able to gather his facts from first hand observation. However, I quickly accepted the fact of Blue Bottles in New South Wales.

Imagine my surprise some months later when I collected one individual of this species at Macquarie Island, 1,400 miles further south!

This specimen is now in the collection of the South Australian Museum, Adelaide, number A1043, and extends the southerly limit of

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Portuguese Man o' war (*Physalia utriculus*) in waters with a Gentoo Penguin (*Pygoscelis papua*).

known distribution of this species by 650 miles to 54° 30' South latitude.

As *Physalia* is a slave to the winds and ocean currents, this occurrence ought not to be considered as unusual as might at first be thought, although to my knowledge this species has not been found at Macquarie Island before.

In discussing the range of this species Shirshov (1969) mentions that insufficient information is available to provide a complete picture of this species' distribution. However, he gives Totton's (1960) reference of 45° 11' S, in the vicinity of Tasmania, as the most southerly record.

Macquarie Island is in the belt of strong prevailing north-westerly winds often referred to as the 'roaring forties.' For this reason many pelagic species or sedentary species attached to floating objects are likely to drift on to the island's western beaches. Dell (1964) mentions the limpet *Nacella kerguelensis* as one such species and the goose-necked barnacle *Lepas australis* as another. The latter is perhaps one of the best examples of this type of travel. Both these species have only been found on beach-washed material, notably kelp in the case of the limpet, and wood, pumice and feathers in the case of the barnacle.

Since the prevailing winds at Macquarie Island are from the north-

west, it suggests that the Blue Bottle mentioned probably originated from the seas adjacent south-eastern Tasmania or Australia. This is also the same general area where the previous most southerly record for this species was recorded.

The appearance of this "tropical" animal at Macquarie Island is both interesting and educational, pointing out the great influence that winds have on the distribution of this species. It also proves the contention mentioned in the opening remarks that one never knows what will be encountered when one walks the tide line of an ocean beach.

Acknowledgements:

The author wishes to thank Dr. R. V. Southcott of the South Australian Museum for confirming the identity of the specimen and Harry Kalmakoff, Department of Modern Languages, Selkirk College for translating the article by Dr. Shirshov. Thanks are also extended to Robert Burn for his kind help in preparing this article.

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Flowers and Plants of Victoria in Colour

Copies of this excellent book are still available, and of course would make a wonderful gift. They are obtainable from the F.N.C.V. Treasurer, Mr. D. McInnes.

A 'little' Little Desert near Cranbourne, Victoria

by VICTOR JACOBS

When I heard a news item that some land in the Cranbourne district had been allocated for an extension of the Royal Botanic Gardens, I was interested but didn't pursue the matter.

When Norman Beaumont later invited me to walk over the area, I was eager to go. Norman had done some valuable spade work by visiting the Cranbourne Shire Offices, and producing a letter from Robert Dunstan M.L.A., Member for Dromana, dated 16 February 1970, and addressed to Mr. Grant, the Shire Secretary.

In essence, the letter is as follows—
“... an agreement by the Premier to purchase land at Cranbourne for an annexe to the Royal Botanic Gardens.

The site will provide an Australian native plants botanic garden, and will also be used to initiate research into the improvement of Australian native plants for horticultural purposes.

The site concerned is allotment 22a, Shire of Cranbourne, just south of the Cranbourne Racecourse. It consists of approximately 396 acres.

To the north is a low-lying area of open swampy country with black sandy soil partly covered with Messmate, Peppermint, Tea Tree and Sword Grass, whilst to the south is an elevated undulating area some 100 feet above the northern area containing Messmate, Peppermint and Paper Barks in the valleys. It is proposed that development will occur in two stages:

(A) A holding period of approximately five years during which the area will be maintained in its natural state with special attention being given to fire protection, vandal control, maintenance of fences and general caretaking. During this period a limited development of nature trails will take place. A botanical survey of the whole area will be made by the National herbarium and the Universities of Melbourne and Monash; together with

the preparation of broad landscape plans for the second stage of the project.

(B) Development:

(i) The establishment of an Australian native plant botanic garden of up to 100 acres as annexe to the Royal Botanic Gardens in Melbourne, using native plants suitable for horticultural purposes.

(ii) The establishment of a research area of approximately 10 acres where selection and breeding of native plants may be conducted.

(iii) To retain in its natural condition an area of approximately 300 acres of natural Cranbourne heathland with admission only through nature trails.”

Norman and I, armed with camera, vasculum and etceteras, headed towards Cranbourne, but not directly to the proposed annexe (1; Fig. 1), but to three smaller areas of Natural History value (2, 3, 4; Fig. 1).

Site 2 is a fenced area of about 25 square yards in the Cranbourne Cemetery. It was fenced to protect the Large Duck Orchids that grow there. The fence is in good condition. As we returned to the cemetery gate we saw good examples of Spike Acacia.

We headed south along the South Gippsland Highway, and just past the South-east corner of the racecourse we saw a rather weathered notice, Bushland Sanctuary (3; Fig. 1). Some large Swamp Gums were hosts to Yellow-winged Honeyeaters and the thick Tea Tree is in a healthy state.

Continuing South we came to the Wildflower Sanctuary on the corner of the Highway and Hastings Road (4; Fig. 1). This area was also reserved for the Duck Orchid and measures

about 3 square chains. We noticed plenty of Common Cassinia, Wild Cherry, and the brown remains of an Umbellifer, *Trachymene anisocarpa*.

Later, investigations into the originators of the scheme to reserve these areas, first led Norman to Colin Lewis, Clerk of Courts, Dandenong; and then myself to Jim Willis and Miss Winifred Waddell O.B.E. When I rang Miss Waddell, who is nearly 86,* I wondered if she would remember her past efforts, but the crisp and vigorous voice was well matched by her memory. She and Miss Nola Burke found the Duck Orchids in the cemetery, and what is now the Wild-flower Sanctuary. In the latter, Spider Orchids, Nodding Greenhoods and Sun Orchids were found too. When I asked why the Bushland Sanctuary was reserved, she replied — "It's a good piece of bush."

No wonder those determined ladies were the prime movers in persuading the C.R.B. to fence the areas. Both parties are to be congratulated. Local naturalists with spare time would find it extremely rewarding to survey these areas in detail over a whole year.

Having dealt with the first part of our plan, we backtracked a few yards to where the Bullarto Road crosses the highway, and turned left to head west. As soon as we had turned the next corner to head south we were following the eastern boundary of the Royal Botanic Gardens Annexe (1; Fig. 1).

A stretch of low vegetation backed by trees was punctuated by yellow spots which I suspected was *Melaleuca squarrosa* but only proved it as such after a fierce tussle to reach it through a tangle of sword grass and tea tree.

On the south-east corner a gate barred our progress by car. Here a

large Manna Gum (*Eucalyptus viminalis* var. *racemosa*) scented the air with honey and swarmed with bees and other insects. An Imperial White Butterfly fed at the large blooms, while ants scurried backwards and forwards from the scale insects.

Traversing the gate we headed west until the yellow face of a recently worked sand pit almost hung over us, and there, opposite an open shed was a gate. We passed over this gate and followed the sandy virgin track that led to the trig. point, the highest in the area. As we walked along I had the distinct impression that I was in the mallee. Yes! Even in Wyperfeld. Admittedly the mallee scrub was absent, but the sandy unused tracks with the regeneration so obvious was reminiscent of other tracks recently trodden, only those were so much more remote that it seems incredible that such an untouched area should still remain so near to our extending metropolis.

After a quarter of a mile we descended from the track on the ridge, forcing our way past the fine leaves and obstructing branches of the tea tree, and then through the scented leaves of the paperbark to the open swamp. A strange area this, with the black rectangular peaty blocks of soil separated from each other by wide trenches still containing water and hurriedly leaping frogs. The dominant plant was Yellow Marsh-flower and the former yellow flowers had been superceded by drying leaves stems and full seed containers. One wonders how an area like this developed. No doubt the summer dry would produce small cracks very quickly, and if the area never holds deep water these cracks would be perpetuated and extended into their present size.

While we were in this hollow, Yellow-winged Honeyeaters and White-cheeked Honeyeaters called often.

We regained the track and followed it through the low tea tree thickets

* Miss Waddell is still an active member of the Native Plants Preservation Society, and also a Secretary for Established Sancturaries.

and Dwarf Sheoke heavily festooned with ornamental cones. As we climbed to the higher ground, banksias in flower appeared, and the ground was thickly covered with Flat Peas. More and more specimens of Spike Acacia were seen and the advanced buds on one specimen left no doubt as to the rod shape of its flower head. A few yards from the trig. point a sandy bank, had scattered over it many ground hugging plants. One, a white heath was in flower. Looking at these few square yards we remarked what a valuable acquisition the area was from a natural point of view, and what an opportunity exists for growing plants from other states.

We had reached the trig. point, and in spite of a haze on this very warm autumn day, appreciated the 360° panorama that was ours. To the north

the ramparts of the Dandenongs, to the south-east a dark patch of mangroves marked Tooradin, and both Western Port and Port Philip Bays were easily located.

We retraced our steps finding a large section with Horny Cone Bush and some dried spikes on a few small Grass-trees. A very young Grey Fantail crossed the track. The next tree contained some White-naped Honey-eaters, and the next a flock of Striated Thornbills. There was plenty of everything for the observer but time.

So we left our "little" Little Desert, having seen but a mere fraction of the botanical and ornithological items of interest; although hoping to have implanted the seeds of interest in others, and equally as important, having spread the news of this valuable acquisition.



Figure 1
(see text)

Important Meeting at Heidelberg.

At Heidelberg Town Hall, on Friday, 28 August, at 8 p.m., a public meeting will be held, to which an invitation to attend is extended to all people interested in the past history and the preservation and conservation of the Yarra valley.

It is vital that a strong and authoritative organisation should be formed to advise on the future of this important area which is already endangered by "progress".

Notes on the Glider-possum, *Petaurus australis* (Phalangeridae, Marsupialia)

By N. A. WAKEFIELD*

INTRODUCTION

The subject of this article is the largest of the three glider-possums which comprise the genus *Petaurus*. Troughton (1941) and others followed Thomas (1888) in placing this genus in the subfamily Phalangerinae of the family Phalangeridae, but Ride (1970) includes it in a separate family, the Petauridae.

In members of the genus *Petaurus*, the gliding membrane extends out to the ankle of the hind-limb and to the hand of the fore-limb (See Figure 1.) The tail is clothed with very long fine fur. The head-body length of *P. australis* averages approximately 11½ inches (29 cm.) and the tail is approximately 18 inches (46 cm.) long. The ears are large and long, with the apical portion bare of fur both outside and inside.

COLORATION

In some specimens the body colour is silver-grey, merging to black on head, limbs, centre of back (longitudinally) and the apical two-thirds of the tail, while the underparts are creamy-white. (See Figures 3 and 6.) In others there is a general infusion of dull yellow, so that the darker colours become brownish and the light underparts are quite yellowish. Thomas (1888) credited the species with rich brown coloration above and orange or cream beneath, and he subsequently proposed a new subspecies, *P. australis reginae* (Thomas 1923) based on a Queensland specimen (female) with paler coloration.

Troughton (1941) suggested that the creamy-white under-colour may be characteristic of the females and young males. However, series of skins, in the National Museum of Victoria, from widely separated parts of the State, demonstrate that the differences in colour represent normal individual variation, and that the extremes may occur in members of any population and in either sex. Paler specimens of Victorian populations have precisely the coloration attributed to the subspecies *reginae*.

VERNACULAR NAMES

The vernacular, Yellow-bellied Flying Phalanger, used by Thomas (1888) and Le Souef and Burrell (1926), was modified to Yellow-bellied Glider by Troughton (1941). Fleay (1947), recognizing that a large proportion of individuals were not yellow-bellied, proposed the name Fluffy Glider for the species, but this has not found favour with naturalists. Calaby (1966) called it Dusky Glider, and that is a most appropriate descriptive name. The matter is confused, however, for Fleay (1947) proposed that Dusky Glider should replace Greater Glider for *Schoinobates volans*. That was rather unfortunate, as the very common black and white phase of *Schoinobates* is not at all dusky. In the long-term view it seems desirable to retain Greater Glider for *Schoinobates* and to adopt Dusky Glider for *Petaurus australis*.

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VOICE

In recording his experiences with *Petaurus australis* in the Mount Wills area, Fleay (1933a) noted that "each time the animal took off, a low, but unmistakable, whirring moan was uttered, . . . and several times before volplaning it uttered a fairly loud shriek". The shriek is translated later as "cha-roo-ka".

Actually, the very loud "cha-roo-ka" is uttered from time to time by a stationary feeding animal or by one climbing about on the trunk or limbs of a tree. Often, when uttered by one glider, the call is answered by another glider a considerable distance away. The whirring moan is a continuous deep-toned humming note which is invariably uttered during the first one or two seconds of each glide. In the majority of cases, but by no means always, the humming note is followed by a gurgling cry which rises and falls rapidly in both pitch and volume and is maintained throughout the glide. Almost invariably, too, the glider utters the loud "cha-roo-ka" immediately upon landing at the end of its glide.

Both the gliding cry and the loud shriek are audible to the human ear at distances of several hundred yards, and the range is probably greater for the keener hearing of the animals themselves. The calling behaviour is evidently an adaptation enabling pairs of gliders to maintain contact while foraging and moving about the countryside, especially when a change is involved to a different area and home tree.

One of the most remarkable features of our local mammal literature is that the Greater Glider, *Schoinobates volans*, has been credited with the voice of *Petaurus australis*. Fleay (1933a) believed that the Mount Wills animals were the

first living examples of *P. australis* that he had seen, and he commented that the "fairly loud shriek" they uttered, "though not as piercing" as that which he associated with *Schoinobates*, "resembled it very closely". Further, in writing of *Schoinobates* (under the synonym *Petauroides*), Fleay (1933b) commented:

The loud gurgling shriek rises sharply up the scale followed by a series of bubbling sounds, and the call appears to be uttered while the marsupials are moving actively and indulging in gliding flights. There is an extraordinary similarity between the call of *Petaurus australis* . . . and of *Petauroides*. Strange to say, however, though members of the latter genus appear to accept captive conditions fairly happily, I cannot recall ever having heard them utter a shriek in these circumstances. In the Beaconsfield bush the animals are specially noisy in the winter months.

Subsequently, Fleay (1947) stated that the call of *Schoinobates* is "a sustained gurgling cry accelerating rapidly as it diminishes in volume", and that the call of *Petaurus australis* "begins with a piercing shriek immediately followed by a more deliberate, scolding, bubbling call of varied inflections". At the same time, he noted that, following the Mount Wills observations in 1933, he realized that he had previously heard the cries of *P. australis* at Upper Beaconsfield, Kinglake and far-eastern Victoria, but had imagined them to come from *Schoinobates*.

Following close observation of both *Petaurus australis* and *Schoinobates volans* in the Yellingbo area, C. Victoria, in 1965 and 1966, I came to the conclusion that it was only the *Petaurus* that uttered the calls described and that the *Schoinobates* was, in fact, quite dumb. A similar conclusion was reached about the same time by others who were studying *Schoinobates*, and C.



Photo: J. Walker.

Figure 1. *Petaurus australis* in flight.

The specimen was caught near Buchan, then released in daylight and photographed.

H. Tindale-Biscoe* stated (letter, 5/10/1966) that neither Roger Smith* nor he had ever heard *Schoinobates* make any sound at all.

There are a number of factors which may account for the original misunderstanding. The two species are often sympatric. The *Petaurus* is vocal but tends to escape notice because of its often timid habits, rapid cross-country movement, and the fact that its eyes are not very reflective in a beam of light. *Schoinobates* is the more abundant, is slow-moving, is not timid, and its eyes are very reflective.

Fleay began by attributing all the

calls of *Petaurus australis* to *Schoinobates*, but, over the years, was able to associate certain calls (those of captive animals and of animals observed feeding in the bush) with their true author. The remaining call, the "sustained gurgling cry" which "diminishes in volume", appeared to remain with *Schoinobates*; but it is, in fact, the typical gliding call of *Petaurus australis*, as it is heard when the direction of the glide is away from the listener.

The work at Yellingbo involved watching individual animals for long periods, using binoculars on moonlight nights and avoiding the use of spotlights, so that undisturbed feeding, climbing and gliding activi-

*Department of Zoology, Australian National University, Canberra.

ties could be observed. This experience, together with more general observations, leaves no doubt that *Schoinobates* is indeed mute and that all the loud shrieks and gurgling calls under consideration are uttered by *Petaurus australis*. When one or other of the calls is heard it can be accepted that the *Petaurus* is present even though the animal itself may not be sighted.

In documenting a survey of mammals in the Richmond and Clarence Rivers area of N.E. New South Wales, Calaby (1966) made comments relevant to the matters under consideration:

"*Petaurus australis* . . . is undoubtedly the rarest of the gliding possums in the survey area . . . Evidence of its presence was obtained in only two localities . . . This species is apparently not known to most locals or is not distinguished by them from subadult examples of . . . *Schoinobates volans*.

Schoinobates volans . . . is the most abundant phalangerid in the survey area . . . It is very conspicuous at night as it is usually high in trees and remains immobile when caught in the spotlight, and it has a very bright eye-shine. It is also rather vocal at night.

The last sentence is evidently a further instance of attributing the voice of *Petaurus australis* to *Schoinobates*, and it indicates that the former was, in fact, less rare in the study area than was supposed.

FEEDING HABITS

According to their foods, species of Australian possums fall into two categories. The smaller kinds are essentially eaters of insects and nectar, and the larger kinds are foliage eaters. Together with several other genera, *Petaurus* belongs in the former category, and of the species in this category, *P. australis* is the largest in size.

Over a period of ten years, evidence has been gathered relating to

the feeding habits of this glider, and the observations concerned are set out in this section under sub-headings according to the species of eucalypts with which the activities have been associated.

The observations do not include any instances of the gliders catching or eating adult insects, but it is assumed that they forage for them about the limbs and foliage of trees. In fact, the absence of evidence of other sources of food in many areas where the gliders have been observed, suggests that arboreal arthropods comprise most of their food.

Most of the data about feeding habits concern the removal of areas of bark from the trunks of various eucalypt trees, to obtain the sugary sap. In this respect, *Petaurus australis* is evidently unique amongst the phalangerids.*

This activity was commented upon by Fleay (1947), who described "scarred and pitted trunks" of Manna Gum trees in the vicinity of Badger Creek, Healesville, E.C. Victoria, and by Brazenor (1950), who referred to "heart-shaped lesions in eucalypt bark".

The significance of shape in this bark-removing process became apparent on close examination of freshly worked trunks of Mountain Gum trees in the upper Buchan River area, E. Victoria, in November, 1968. Actually, the bark is usually removed in such a way that the lower edges of the bared sapwood form a neat V-shape. The innermost bark layers, at the edge of the V, are trimmed as neatly and as straight

*Ride (1960) says that *P. norfolcensis* and *P. breviceps* "feed on the sap of branches which they strip and pierce with their powerful incisors", but does not credit *P. australis* with the activity. Observation in Victoria indicates that, though the smaller species may lick exuding gum, their bark-tearing is restricted to dry outer layers from which they obtain insect larvae.



Figure 2. Trees scarred by sap-tapping operations of *Petaurus australis*.

A. Mountain Grey Gum near Buchan. (Note V-shaped scar near top.)

B. Fishbone pattern on trunk of Apple Box near Wingan River.

C. Trunk of Apple Box at Gipsy Point, showing comparatively crude sap-tapping operation.

as if a sharp knife were used. The sap flow is thus channelled to the point of the V, where it can be licked up during periodic visits by the glider. This is precisely the method used to tap the sap (latex) of rubber trees. Figure 4D illustrates the edge of one of the V-shaped incisions on a Manna Gum trunk near Noojee, E.C. Victoria. In this case the sloping channel has been gouged quite deeply.

The implement used, both for the removal of large pieces of bark and for the final trimming, is the pair of procumbent lower incisor teeth. These protrude approximately half an inch (13 mm.) beyond the apex

of the jaw, their combined width at the base is approximately 5 mm., and they taper to a fairly sharp point. Claw marks associated with work on the Mountain Gums near the Buchan River indicate that, when gouging with the chisel-like incisors, the glider clings tightly with the widely spread fore-limbs, while the hind-limbs are used as props without their claws being fastened into the bark.

Although sap-tapping is given prominence in this article, it evidently constitutes the least important of the gliders' food-getting operations. I have observed four pairs of *Petaurus australis* feeding on nectar and only one pair actually feeding on sap.

Apple Box, *E. bridgesiana*

On about 1/1/1960, two trees were examined near Wingan River, E. Victoria, each with large scars where bark had been removed. Near one of these trees, Messrs. D. and J. Hodson, who drew my attention to them, had observed a specimen, identifiable from their description as *Petaurus australis*, curled up asleep on the ground. It awoke, climbed a nearby tree and entered a hollow.

The second tree, which stood about a mile away, is illustrated in Figure 2B. The scars make a definite fish-bone pattern on the trunk. It was visited again on 12/9/1961 but showed no sign of any further working. However, that night another tree was located about 100 yards away, where two gliders were busy licking sap from incisions in the trunk some 25 feet from the ground. Occasionally one or other of them uttered a loud call. The lower animal was photographed (Figure 3), and it was so intent on its feeding that it did not stop, even to look down, when some sticks were thrown near it. These were probably the animals responsible for operations on the other tree nearby, for the pattern in each case was almost the same. None of the other Apple Box trees in the vicinity had been worked.

On 17/11/1965, two further trees were examined in the Wingan River area, about two miles from those found by the Hodsons. They stood about half a mile apart, on the property of B. H. Buckland, and in each case none of the other Apple Box trees nearby had been tapped for sap. One had a trunk approximately 30 feet high, patterned with numerous V-shaped healed scars (Figure 4C) as well as areas of bark removed quite recently, and Buckland reported having heard and seen

the animals working at it some weeks before. The second tree was very large, with a 50-foot barrel covered with comparatively small scars of various ages. It is the tree on the extreme right in Figure 5. The two photographs were taken on 27/12/1965, and the area was revisited on 1/11/1966 and 17/1/1968, but on none of the four occasions were any gliders heard or seen in the area.

Figure 2C is a specimen of Apple Box at Gipsy Point, 5 miles east of Genoa, E. Victoria. A second tree nearby bore similar scars but none of the many others did. An evening's observation revealed no sign of the gliders, though four had been seen there on the night of 11/11/1962 by R. E. Taylor, Fisheries and Wildlife Inspector of Mallacoota.

A tree similarly scarred to that shown in Figure 2C was observed a number of times in 1965 and 1966 at Canni Creek, 7 miles S.S.W. of Buchan, E. Victoria, but dates were not recorded. It was not worked during the period of the observations. The Gipsy Point and Canni Creek operations appear to be of somewhat cruder workmanship than those observed in the Wingan River area, and each evidently represents only a single sap-tapping episode.

"Witchety Grub" Extraction

Another Apple Box tree on the Buckland property at Wingan River (that in the foreground in Figure 5) had a large area of bark removed, evidently in search of the large concertina-shaped "witchety grub" type of boring larvae of certain large moths or longicorn beetles. The horizontal tunnels that these larvae had made were bared, in some cases almost round the tree.

A similar set of excavations had been observed on 9/1/1961, on an



Figure 3. *Petaurus australis* feeding on sap from trunk of Apple Box near Wingan River.

Apple Box tree at the head of Mississippi Creek, 5 miles east of Bruthen, E. Victoria. No glider was seen in the vicinity but the typical shriek was heard at night in the forest nearby.

On 27/9/1968, an Apple Box tree, debarked in the same way, was found by the Jacobs River, in far-southern New South Wales, about a mile from its confluence with the Snowy River. On the night of 19/11/1968, during some hours of spotlight observing along the two rivers, no sign was seen of *P. australis* and its call was not heard.

On 19/5/1969, several Apple Box trees which had bark ripped off by animals seeking larvae were found close together in a small flat by the Suggan Buggan River, E. Victoria. One sizable tree had died as a result of the ring-barking.

An example of this operation is illustrated in Figure 4A, with the bared horizontal tunnels clearly visible. The photograph was taken near the Pyramids by the Murrindal River, 4 miles N.N.E. of Buchan, on 21/11/1969. The debarked section was only 1½ to 3 feet above ground level.

A further example was seen at the Reed Bed, 4 miles west of Cann River, E. Victoria, on 6/12/1969.

These larva-seeking operations are believed to be the work of *Petaurus australis*, but this has not been confirmed by observing animals at work. Black Cockatoos extract large boring larvae from tree-trunks, but they dig deep into the wood, to precisely where the larva is, evidently being able to locate its position by their keen hearing. Fleay (1947) found that in captivity *P. australis* did not display any fondness for the "concertina larvae of longicorn beetles".

Manna Gum, *E. viminalis*

During a 2-year period, from September, 1965 onward, a series of night observations were made along Woori Yallock Creek and its tributaries in the vicinity of Yellingbo, C. Victoria. There are corridors of mixed Swamp Gum (*E. ovata*) and Manna Gum forest along the streams.

A pair of *Petaurus australis* used the area from time to time, taking up residence for periods varying from several days to a few weeks, and at other times they could not be found or heard in the general area. For example, they were present when the locality was visited on 17, 18, 19, 20, 23 and 24 January, 1967, but were not there when visits were made on 25 and 26 January, 11 and 25 February, and 4 March. On 18 and 19 March, they had returned and were feeding on nectar of Manna Gums which had recently come into flower.

Amongst the many Manna Gum trees in the Yellingbo area, there were three, separated from each other by intervals of over a mile, which bore numerous scars due to operations of the gliders. However, the animals did not work on these trees during the two years of observation, though they did attack one other tree during the time, to about

Figure 4. Examples of work of *Petaurus australis*.

- A. Trunk of Apple Box (diam. 15 inches), near Murrindal River, with bark removed in quest of "witchety grubs." (Note horizontal tunnels.)
- B. Healed scars after a single sap-tapping operation on Manna Gum (diam. 2 feet) near Wingan River.
- C. Healed V-shaped scars on trunk of Apple Box (diam. 2 feet) near Wingan River.
- D. Neatly trimmed and deeply gouged edge of V-shaped cut in bark of Manna Gum near Noojee. (One-third natural size.)



the extent which is illustrated in Figure 4B.

Figure 4B illustrates a set of healed scars on a Manna Gum on the Buckland property at Wigan River. This was observed first on 17/11/1965 and was photographed on 27/12/1965. Evidently the scars represent a single operation performed in spring that year, and there has been no subsequent work on that tree.

On the night of 13/11/1965, W. King observed two of the gliders feeding on the trunk of a large Manna Gum approximately 2 miles north of Noojee. The animals were not in the area when he and I visited it some months later. On 18/10/1969 it was found that the trunk had been worked considerably within the past several days. The photograph comprising Figure 4D was taken on that occasion. The tree bears evidence of a history of sap-tapping extending over many years. Also on 18/10/1969, a tall slender much-worked Manna Gum was noted approximately 6 miles west of Noojee.

Blue Gum, *E. bicostata*

A massive Blue Gum, with numerous scars due to sap-tapping, was found on the western side of Mount Drummer, E. Victoria, on 15/11/1962. On 31/10/1966 it was noted that there had been some recent working at the same tree. Of the many Blue Gums in the area, only the one was found to be scarred by the gliders.

G. G. George had reported (letter, 3/4/1962) seeing *Petaurus australis* amongst that area of Blue Gums in January, 1961. On the night of 28/12/1965, I observed two specimens in Blue Gums approximately 6 miles N.N.W. of Buchan.

Shining Gum, *E. nitens*

On 27/2/1966, in the forest of Shining Gums, a few miles west of Cumberland Junction, E.C. Victoria, a single huge tree was found with innumerable scars of various ages on the trunk. Several visits were made to the spot between September 10 and October 1 that year, and *Petaurus australis* was present on each occasion. Some additional tapping had been done shortly before September 10. There was no evidence of the animals in the area on the occasions of two visits during 1967, but on 26/12/1969 it was noted that some small patches of bark had been removed recently.

The removal of small areas of bark, from various eucalypt species, both from previously worked trees and from trees not otherwise worked, has been observed in a number of places, and it is presumed that the gliders had been testing the qualities of the sap.

W. King (pers. comm., 30/5/1970) reported that on 9-10/12/1967 he observed *P. australis* in Shining Gum at 3,400 feet elevation in the upper Thompson River area, and that on 24/1/1970 he heard it in trees of the same species at 2,600 feet elevation near Starling Gap. These localities are respectively 13 miles N.E. and 14 miles W.N.W. of Noojee, E.C. Victoria.

Mountain Gum, *E. dalrympleana*

About a mile east of Native Dog Flat, upper Buchan River, E. Victoria, there are several specimens of Mountain Gum with trunks extensively scarred by *Petaurus australis*. They were observed on 20/11/1968 and again on 28/1/1969, and some tapping had been done between these dates.

Fleay (1933a) and Brazenor (1934) identified the trees in which



Figure 5. Feeding area of *Petaurus australis* in Apple Box forest near Wingan River.

The tree in foreground has been de-barked in quest of "witchety grubs," and that on extreme right bears numerous scars from sap-tapping operations.

they saw *Petaurus australis* near Mount Wills as "Manna Gum (*E. viminalis*)", but these would have been *E. dalrympleana* at that elevation. (The two species were not generally recognized as distinct at that time.) Fleay noted that one of the gliders "appeared to eat the finer tips of some tender suckers growing out from the main trunk of a eucalypt". If this was in fact a feeding activity, it is safe to assume that insect food of some kind was taken, not the leaves themselves. Otherwise he noted that the glider fed on exuded gum for three-quarters of an hour and then on nectar from the blossoms for several hours. Brazenor (1934) stated that the blossoms themselves were consumed, but Fleay's interpretation would have been the correct one.

On 23/4/1966 I observed *Petaurus australis* in Mountain Gums at approximately 4,000 feet, two miles east of Mount Nugong, E. Victoria. The gums were flowering in that area but no actual feeding observation was made.

Mountain Grey Gum, *E. cypellocarpa*

Though this is a widespread and abundant component of E. Victorian forests, only one has been observed with evidence of gliders' sap-tapping. It is approximately 6 miles south-east of Buchan, and was first observed on 9/4/1966. When photographed on 31/10/1966 (Figure 2A) some recent working was evident.

Bloodwood, *E. gummifera*

The Bloodwood occurs in Victoria only in the extreme east, near Malla-coota, and is there quite abundant. Its forests are evidently inhabited by the gliders but very little observation has been carried out there.

Trees scarred by sap-tapping were

noted on 26/3/1966 in one place, and a more extensive search (10-11/4/1966) revealed that worked trees were scattered, fairly plentifully, through the Bloodwood forests. On the latter occasion, gliders were observed feeding on nectar from the abundant Bloodwood blossoms, two pairs of animals in one place and one pair in another spot about three miles distant.

Messmate, *E. obliqua*

On 16/10/1966, a Messmate tree, from which gliders had removed areas of bark, right to the sapwood, was discovered 2 miles south of Emerald, C. Victoria. Gliders were heard in the area that night but none was seen at the tree. A second Messmate specimen, similarly operated upon, was noted on 17/3/1967, 3 miles north-east of Monbulk, in the same district. On 26/12/1969, a grove of Messmates was examined in the latter locality and two were found with both new and old sap-tapping scars, while several other trees showed evidence of minor, possibly exploratory, attention. It is remarkable that the small animals are able to tear through the layers of tough stringy bark, 2 to 3 inches thick, that encase the trunks of those Messmates.

Red Ironbark, *E. sideroxylon*

Buckland (1960), writing of gliders at Malla-coota, which he thought at the time to be the Greater Glider (*Schoinobates*), noted that "when the eucalypts, especially Red Ironbark are in flower, the very distinctive calls of these animals can be heard throughout the night". The reference to calls, and an accompanying comment about the extent of the gliding membrane on each leg, leaves no doubt that these notes apply to *Petaurus australis*.

DISTRIBUTION

Petaurus australis belongs to temperate eastern Australia, ranging from the Bundaberg area of S.E. Queensland, through eastern New South Wales and eastern and southern Victoria, to the forests north-west of Portland. Skeletal remains from an aboriginal shelter near Donovans Landing (*leg.* A. C. Beaglehole, 9/10/1963) indicate that the species ranged into the extreme south-east of South Australia within the past few hundred years, and it may still occur there.

In Victoria it inhabits a wide range of forest types, from about sea level to approximately 4,000 feet elevation. In central Victoria its preference is for the stands of tall straight Manna Gum trees along foothill streams and Shining Gum at higher elevations. In the lowlands of Eastern Victoria it favours Apple Box trees of dry sclerophyll forest formations, in the more eastern highlands the wet sclerophyll forests of Mountain Gum are preferred, and in the associated foothills the glider frequents Blue Gum forests.

The lower parts of the valleys of the Jacobs and Suggan Buggan Rivers, as well as the environs of the Snowy River, into which the other two flow, are parts of a comparatively dry area receiving only about 20 inches rainfall per annum. The general forest is open woodland of White Box (*Eucalyptus albens*) and cypress-pine (*Callitris*). However, along the banks of the rivers there are Manna Gums and Apple Box trees which evidently provide narrow corridors of suitable habitat for *Petaurus australis*. This riparian growth would be classed as dry sclerophyll forest. E. Watkinson reported (*pers. comm.*, 19/11/1968) that in the vicinity of his home by

the Suggan Buggan River, the species may be heard for several nights in succession and then not at all for many months.

At the beginning of his account of the Mount Wills observations, Fleay (1933a) mentions an elevation of 4,800 feet, and "searching the woolly-butt* and Manna Gum forest". With these comments as basis, Troughton (1941) located the observations at "about 5,000 feet in the Woollybutt Gum belt". But Fleay was not specific regarding the disposition of the two tree species in the area or the actual elevation at which the gliders were observed. Usually, the upper limit of the "woolly-butts" is at about 5,000 feet, and the upper limit of the Mountain Gum is several hundred feet lower.

The species referred to by Fleay as woolly-butt* is, in fact, Alpine Ash (*Eucalyptus delegatensis*). During the past ten years I have examined a number of areas of Alpine Ash but to date have not recorded *Petaurus australis* in stands of that species. However, W. King's observations at upper Thompson River included the sighting of the species in Alpine Ash trees where these were associated with Shining Gum. It is probable that the true association, both in this locality and at Mount Wills, was with the gum species rather than the Alpine Ash.

Petaurus australis evidently does not favour the wettest Victorian forests—those comprising pure stands of White Mountain Ash (*Eucalyptus regnans*). Despite extensive observations, I have never seen or heard the species in these forests, and as

*Fleay identified this eucalypt as *E. longifolia*, which is the name of the true Woollybutt Gum, a native of New South Wales but not Victoria. Brazenor (1934) identified the Mount Wills "woolly-butts" as *E. sieberiana*, which is a synonym of *E. sieberi*, the Silvertop, a tree of lower elevations which is erroneously referred to as woolly-butt in some districts.

far as is known there is no record of such association.

Le Souef and Burrell (1926) assessed the habitat of *P. australis* as "open timbered country", and commented that they had "noted it in eastern Victoria, where the Yellow Box and Red Gum were predominant". This would indicate that the species inhabits the woodlands of the Gippsland Plains, where Red Gums (*E. camaldulensis* and *E. tereticornis*) are the dominant trees. During the present study, no evidence to support this has come to light, and it is more likely that the species was noted in forest formations lateral to the Red Gum woodlands.

GLIDING AND OTHER BEHAVIOUR

Petaurus australis moves with speed and agility, especially amongst the high branches of trees. It will scamper along a slender branch, for instance, and, without a pause, leap across several feet of clear space to land amongst the twigs of a nearby tree.

When frightened, it may seek a concealed position and remain motionless there for a lengthy period. One individual, when illuminated by spotlight, moved down into the fork of a tree trunk and remained there for some time with only its tail visible. Another, when a Powerful Owl was hunting in the vicinity, was observed to hide on the underside of a large horizontal limb, and it was still in precisely the same position when observations were made again at the spot over an hour later.

During 1965 and 1966, in the Yellingbo area, a number of glides of *Petaurus australis* were accurately measured (using Abney level, plumb-bob and steel tape), and it was found that, almost invariably, the line of flight was very close to 30° to the horizontal. By contrast, *Schoinobates*

usually glided at approximately 40° to the horizontal. This is an expression of the different gliding abilities of the two species, and it is probably because the gliding membrane of *Schoinobates* extends only to about the elbow of the fore-limb.

Petaurus, moreover, often makes several glides in quick succession, thus covering several hundred yards in a few minutes, whereas *Schoinobates* is typically slow in its movements and apparently does not range far from its home tree. This is evidently because the one is a nomad, ranging widely according to availability of nectar, insects and sap, while the other is a sedentary foliage-eater.

Some long glides, attributed in the literature to the *Schoinobates*, belong, in fact, to *Petaurus australis*. Buckland's notes (*loc. cit.*) provide an example, but the length given for a glide, 130 yards, would be an over-estimation, as the trees in the locality are not high enough for such a performance.

Troughton (1941), in discussing *Schoinobates volans*, states that it is "naturally the record glider of the possum world", and in support of this he cites a report of an animal which was observed by a resident of Milton, New South Wales, to cover a distance of 590 yards in six successive glides, two of which measured 120 yards each (from tree to tree) and another of which was from a tree 100 feet high to the base of a second tree 70 yards away.

The 70-yard glide from a 100-foot tree indicates an angle of descent of 26° to the horizontal, and, even allowing for sloping ground and a margin of error in the measurements, this performance, though well within the capabilities of *Petaurus*, is quite outside that of *Schoinobates*. Also, for the 120-yard glides,

Schoinobates would require, for its 40° descent, a take-off point approximately 300 feet high, while *Petaurus* would need a 200-foot tree. Other features of the Milton resident's report — that during the performance the animal "lost no time in ascending three more trees" and that "it uttered

its peculiar squealing call" — leave no doubt that the "record glider" was, in fact, *Petaurus australis* and not *Schoinobates volans*.

The aerobatic ability of the *Petaurus* was demonstrated in the Shining Gum forest near Cumberland Junction on the night of 10/9/1966, when a spotlight beam was directed at a glider which was approaching through the air. Its response was to bank steeply, execute a tight half-circle, and then land in a tree back in the direction from which it had come. (See Figure 6.)

What may be claimed as the record glide was observed in the same locality on the night of 24/9/1966, and subsequent measurement and calculation showed that the take-off point was 215 feet high, the horizontal distance covered was 376 feet, and the actual air distance was 430 feet.

SUMMARY

Petaurus australis, in the one population, may vary from brownish above and yellowish beneath to silver-grey and black above and creamy-white beneath. *P. australis reginae*, based on a pale specimen, is evidently not a valid subspecies.

The vernacular, Yellow-bellied Glider, is unsatisfactory and could well be replaced by Dusky Glider.

The species is essentially an insect-eater and nectar-eater, and it occasionally removes bark from trunks of eucalypts to obtain sap. Usually the bark is removed in a V-shape, with the lower edges

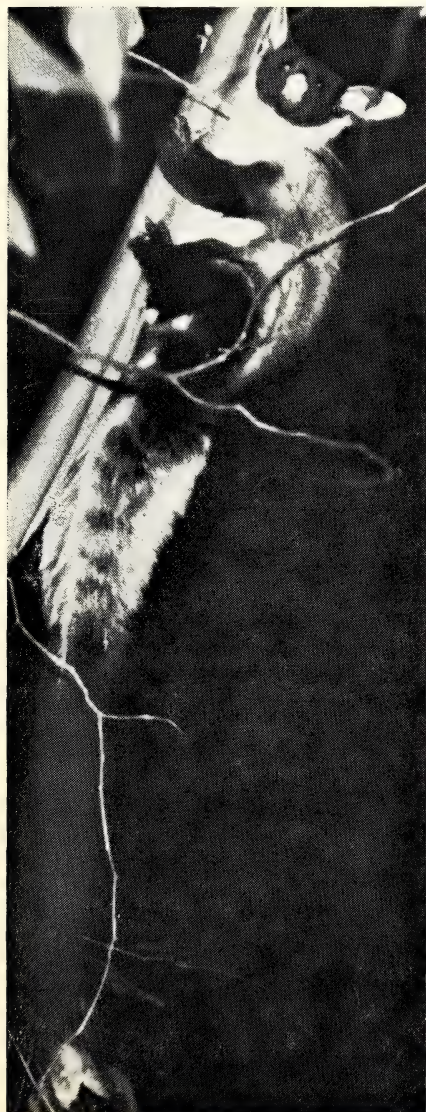


Figure 6. *Petaurus australis* in Shining Gum sapling near Cumberland Junction.

This animal had landed here after gliding round in a half-circle.

trimmed so that sap drains to the point, just as latex is tapped from rubber trees. In Victoria, sap-tapping is carried out mainly on *Eucalyptus viminalis* and *E. bridgesiana* and to a lesser extent on *E. bicostata*, *E. dalrympleana*, *E. gummifera*, *E. cypellocarpa* and *E. obliqua*. Very few trees are selected for this purpose, but those chosen are usually tapped at intervals over periods of many years. It is believed that the glider also removes bark from *E. bridgesiana* in quest of large boring insect larvae.

P. australis ranges from S.E. Queensland to about the Victoria-South Australia border. In Victoria it inhabits both wet and dry sclerophyll forests, from sea-level to about 4,000 feet elevation, but does not favour the very wet forests of *Eucalyptus regnans*. Its habitat includes the narrow corridors of sclerophyll forest along streams in the comparatively dry areas of open woodland in the Snowy River valley.

It is quick in its movements, is capable of gliding at least 125 yards (horizontal distance) at a time, and habitually travels rapidly across country by means of a series of glides. It is nomadic, according to availability of its various foods. Individuals often call loudly while feeding, climbing about or gliding, thus enabling pairs to keep in contact while foraging and during cross-country movement. The voice and gliding accomplishments of *Petaurus australis* have been credited erroneously to *Schoinobates*, which is, in fact, a sedentary, slow-moving, silent animal of minor gliding ability.

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APPENDIX

Following are latitude (south) and longitude (east) of the principal localities mentioned in the article:

Beaconsfield Upper	38°00', 145°25'
Bruthen	37°43', 147°48'
Buchan	37°30', 148°10'
Buchan River, Upper	36°53', 148°05'
Cann River	37°34', 149°09'
Cumberland Junction	37°34', 145°56'
Donovans Landing	38°02', 140°57'
Emerald	37°56', 145°26'
Healesville	37°40', 145°31'
Jacobs River	36°45', 148°27'
Kinglake	37°32', 145°21'
Mallacoota	37°33', 149°45'
Monbulk	37°52', 145°24'
Mount Drummer	37°34', 149°21'
Mount Nugong	37°13', 147°55'
Mount Wills	36°49', 147°28'
Noojee	37°55', 146°00'
Portland	38°21', 141°36'
Suggan Buggan River	36°57', 148°25'
Wingan River	37°33', 149°27'
Yellingbo	37°49', 145°31'

Wallabies We Knew

by

JEANETTE KING

(Illustrations by Author)

We lived on an island in Tasmanian waters for about ten months, and except for one other family, were fifty miles from people, telephones and shops. The sea was an efficient moat, and preserved our isolation. The *Victorian Naturalist* of 1891 describes the island as being "about four miles by two and very hilly. The valleys are mostly covered with thick tussocky grass, knee deep, and the hills with short dense scrub, consisting principally of Sheoke, Melaleuca, a small variety of eucalyptus, Pine (*Callitris* sp.), Banksia, Acacias and Teatree. All around the island except in the coves are bold granite cliffs, and limestone is plentiful near the surface. There are several hills between 500 and 700 feet high."

The house we lived in was enclosed in a valley formed by the hills on three sides, and was sheltered from all but the north-west winds. The first wallaby we met was Nelson, a female about a year old; one of her eyes, although present, was permanently half-closed, pre-

sumably the result of a fight, or damage done while moving through the scrub in a hurry. Her mother, Gertie, had been allowed the run of the place when the people previous to us had lived there, and they had seen Nelson brought out of the pouch and watched her grow up.

When we arrived, the lawn was in an unpleasant state for barefooted walking, so we declared the lawns of front and back yards out of bounds to the wallabies. The possums there were tame, but when you are entirely dependent on the water from the roof for drinking, they are not welcome visitors.

After months of observing the wallabies closely, and coming to know them individually by sight, we believe they are of two separate types; although very similar, there are slight differences. One group was of a more uniform grey, not as thickly furred, and rat-like in appearance. The other type was prettier, of heavier build, with thicker fur more reddish on the neck, and had facial features similar to deer. The population of wallabies on the island was large, and seemed to be broken up into groups which moved about together. The two types were to be found among any group. Each group had its own territory, but transference from one to another would appear to be not unusual, and often a wallaby was seen quite a distance from its home.

It took some time to become accustomed to being able to glance out of the windows and see wallabies grazing unconcernedly only a few feet away, and the St. Fran-



ciscan procession following my bearded long-haired husband as he held pellet-tin on high; with dog, child, hens and rooster, and seven greedy wallabies clutching at his trousers as he walked. A sound which became familiar was the "bong, bong, bong" of speeding wallabies' feet on the ground. In a short time, encouraged by the presence of the already tame ones, as many as seven would come when we called. On hearing a yell of "come on, come on," they would converge on us from hiding places in the scrub, the tamer ones coming close, the shyer ones remaining at a strategic distance. Occasionally a strange one on his way past would step out of the bushes to investigate, and sometimes these could be persuaded to become part of the group of regular visitors, but the attraction was more likely to have been the females rather than our proffered tidbits and company.

All of them loathed being touched either by human or their own kind, and even after some months of acquaintance they would, unless urgently occupied in eating, hop off or turn and warn the offender with a huff, at the same time shaking their ears in a manner meant to threaten. The huffing noise, more of an exhalation than a growl, was the only vocal sound they ever made, even when in pain or badly frightened. When one did manage to

stroke them (and this was only possible while the wallaby was eating) the ribs of even the fattest felt like the rungs of a corrugated water-tank.

On one occasion, as we returned from a climb through the scrub nearest the house, we came upon the dog sitting guiltily beside an immobile wallaby. After watching its completely silent, frantic and useless efforts to right itself without the use of one apparently damaged leg, the only thing to do seemed to be destroy it. With difficulty it was held, the leg manipulated in circles and the animal set back on the ground; it bounded off in a normal manner. Throughout its certainly painful and distressing experience, it had made not a sound of protest or fright.

The ears swivel in a full circle, and usually each is in a different direction from the other, and constantly alert. A proffered morsel will be investigated with a nose-twitch and sniffs, often from such a distance and at such a stretch that the reluctant, or lazy, wallaby would topple sideways. All their eyes are brown, round and shiny, rimmed with stiff eyelashes like those of a doll.

Their arms and shoulders were thin and narrow, much more ineffectual in appearance than those of the kangaroo, and had little strength. Their five-fingered hands were like those of a bony long-nailed old lady



wearing black wrist-length gloves.

Once, after a boat had been anchored in one of the bays, Gertie showed up with one arm dangling. Hoping it was simply out of joint, we caught her, intending to manipulate it back into place as had been done before. It appeared however to have a bullet in the shoulder, and since there was little we could do she was set free. It healed and although after a time she could move it a little, it flopped useless at her side.

The largest of the wallabies we knew were no more than a head taller than the hens, and when food was placed before them as a communal meal, the wallabies missed out on the choice items because of their docility and slowness. A pair of weak paws holding a slippery apple was never a match for a well-driven beak, and upon losing his food, the wallaby would placidly look around for something the fowls did not want.



They liked all vegetable matter, including orange and even banana peels, and although not keen on lemon peel would eat it if there was nothing else on hand. Usually only the clown known as Chook was seen to suffer for his over-eating,

and would regurgitate his food in a most comical manner after a particularly big feast. The favourite food of all was the bark of a casuarina branch: they were unable to reach high enough to obtain this themselves, but when a broken branch fell to the ground every fibre of bark was stripped in a very short time. They were indiscriminate in their choice of natural food, and although we watched them closely to find if there was some variety of grass or tree they did not fancy, found there was nothing they would not sample from time to time. They were fond of the buffalo grass in the lawn, but perhaps only because it was readily available and obtainable with the least effort, involving only a rush into the yard if the gate was left open.

Each had a tussock of his own to which he returned every day, spending most of the time there, actively fossicking for food only in the morning and evening. During the dark nights they would disappear, but in bright moonlight still congregated near the house. After following the well-beaten tracks they had made through the scrub, we found an area encircled by casuarinas, of tussocks each moulded into a primitive "nest" on the side away from the wind. Presumably the wallabies spent their nights in this pleasant place.

When a gale was blowing, they would bound along with the wind behind them from the casuarinas, each to his tussock, and spend the day stretched out on the lee-side, snug in a bundle of strawy tussock-hair.

When the rain was wetting enough to bother them, they would move over to a sheltering line of eucalypts and scrub, and sit beneath these in a row, looking like a queue

of matrons waiting at a bus-stop. They sat with hands together over round bellies, in a trance until a muscle went to sleep and they would be obliged to alter position, waiting until the rain stopped before moving back to the open area.

They felt the heat badly, and by nine or so each hot day would flake out in the shade, remaining still all day. We were told they had ticks, but never found any — however, much of their time was spent in vigorous scratching and monkey-like investigations amongst the fur. The young females, particularly one we named Salome, were able to effect a cooling device by opening the pouch, and a small round patch of pink skin was exposed in the fluffy belly fur. Sitting down was an elaborate proceeding, rather reminiscent of a bride managing a turn in a dress with a long train. The wallaby would prop upright, lean to one side, sweep his tail around between his legs and sit down on the cushion thus provided. As the tail was now so close at hand, the opportunity was often seized in both paws, and an energetic scratch of the leathery working side of the tail would follow.

The group usually consisted of old Gertie, her young daughter Nelson, Chook—because of his fondness for pellets and investigation of the chook-yard, where he was able to

get in via the twelve-inch square opening, but could never manage to return through it — and Ron, a large female, the most beautiful of all, named by our son. (We were peering through the window at her before we knew them all, and when I asked if it was Chook and was told “wrong gender,” our son took it that she had been christened “Ron Genda,” and “Ron” thereafter she remained.) We could not work out with any certainty the relationships between them all, but it seemed that Gertie was the matriach, that Nelson was her daughter we knew, Chook, a male, was the same age as Nelson and must have migrated from another group, and middle-aged Ron, Salome visited only occasionally, and Josie, Gertie’s second joey was not long out of the pouch and preferred to remain just hidden in the scrub. Often the group would include large males who did not stay long enough to be named, and although the young females would surely be the more interesting, they courted old Gertie, and Ron.

After a time, Ron had become noticeably portly, and on closer inspection we concluded she had a joey of approximately three to four inches in length in her pouch. Gertie’s two offspring had arrived before we did, and we hoped that we would be able to see one brought out of the pouch. At times Ron would sit back on her haunches, rummage through her pocket, and investigate the contents. As the weight grew increasingly burdensome, and we could see vigorous internal jumpings, she found difficulty in bending over to eat, and her appetite was insatiable. She was always first to arrive at mealtimes, and became desperately greedy in her attempts to obtain the lion’s share of food.



The two matrons had dreadful fights, standing erect, using feeble swipes of the hands to find the other's eyes, and long-nailed feet to rake the other's belly. This was distressing to watch, especially when a pouch was filled with an active, growing bulge. Some damage must have been done in this way, as a few days after one bout Ron re-appeared with an empty pouch and a most miserable attitude.

Mating must have taken place at night, since it never did during the day. When Chook or one of the strange males felt amorous he would languidly approach Ron or Gert from the rear, and clutch at her back while she was bending over to eat — invariably she would simply hop one or two paces ahead without even appearing to notice him, and continue eating until he caught up again and made another perfunctory grab. Not once would she turn to look at the pursuer or show interest in anything other than the grass she cropped all the while. So the pair would proceed around the house for hours, and whether he ever caught up when she led off into the bush we do not know. The strange visitors grew very possessive, and would swipe and huff at anyone approaching his mate. Even a joey returning to the pouch for a drink would be bowled over, eventually learning to keep out of the reach of the new

object of his mother's attention.

As a farewell gift when we left the island, we extracted from the garden two dozen cabbages nursed along unsuccessfully for nine months, piled these up in front of them all, and drove off down the rutty road as they huffed and fought each other for them.

The value of this co-habitation is enhanced by the knowledge that not only may it be unique (or is growing increasingly more likely to become so) but also by the fact that the wallabies were free to come and go as they pleased, and it flattered us that they chose to seek our company. I know of relatively few places on the mainland where this could happen today, and even the glimpse of a startled wallaby disappearing into the bush is rare, outside zoo or sanctuary.

The next occupants of that house allowed their large dog to do as he pleased, and our wallabies were found dead on the back lawn.

.

The islands of Bass Strait are considered by the fishermen as convenient and never-abating sources of readily obtained items for use as bait on sharklines or in craypots. No other portion of wallaby is found to have anything worthwhile on it, so they are killed just for the legs. When next you enjoy a crayfish, spare a thought for the wallaby who donated the bait in the craypot!

Field Naturalists Club of Victoria

General Meeting

13 July, 1970

Mr. T. Sault, the President, opened the meeting and extended a welcome to the 80 members and guests present.

Mr. D. Lee, the Secretary, called on members who had tabled exhibits to

come forward and speak briefly on their displays.

Exhibits:

Mr. D. McInnes—Fossil coral specimens collected on the Geology excursion

to Lilydale Quarry and under the stereo microscope, a mat plant (*Corsicala*); a moss common on garden paths and pond life (*Daphnia*).

Mrs. E. Bennett—An uncommon Gall on a Peppermint Gum from the South Gippsland area.

Mr. R. Condron—Wood White Butterfly and Pupa Case (*Delias aganippe*). The pupa was originally collected by Mr. T. Sault and shown at the April meeting. The butterfly emerged on 19th June.

Mrs. G. Taylor—5 Jewel Shield Bugs from East Alligator River, Northern Territory and a giant bean pod (*Cassia* spp.) from Darwin.

Mr. J. Myers—A Brachiopod of the Triassic period (*Clavigera bisulcata* Hector) from the Melton District, South Island, N.Z.

Mr. Ken Strong—Washed river sand under the stereo microscope displaying colors by light passing through polaroid and sellotape.

Mr. T. Sault—Several specimens of land mollusca, to be forwarded to Dr. Brian Smith for his survey.

Mr. A. Swaby—a number of species of native flora. Notably the Hairpin Banksia (*Banksia spinulosa* previously *B. collina*) and the Australian Bluebell (*Sollya fusiformis* previously *S. heterophylla*).

The poster to advertise the Nature Show, drawn by Miss M. Lester was also tabled.

Mr. J. Myers, F.N.C.V. delegate to the Lerderberg Forest Park Committee of Management, reported on the work of the Committee for the past half year and gave details of improvements already undertaken and proposed future developments to cope with the expected increase of visitors to the area. This report will be published in full in the Victorian Naturalist at a later date.

The Secretary announced that Mrs. Daisy Wood had resigned from the You Yangs Forest Park Committee and a new delegate was required. Mrs. Poole had been nominated and this was to be referred to Council.

A letter was received from Mr. Lionel Kell Elmore of Hamilton requesting support for the declaration of Mt. Napier as a National Park. Mt. Napier, an extinct volcano with parasitic cones and several lava flows would be an ideal area for preservation as a geological monument.

The President announced the impending retirement of the Secretary, Mr. D. Lee, in December and called for nominations for his replacement.

Mr. D. McInnes would be retiring from the Nature Show Committee after the coming show and a new Director was needed. The Club's patron, Sir Rohan Delacombe, advised that he would be unable to attend this year's show because of a prior engagement.

Mr. J. Myers would be attending the University of New England Spring School at Warrumbungle, N.S.W. in September and had 3 vacancies available. Those interested to contact Mr. Myers.

Mr. R. T. M. Pescott, retiring Director of the National Herbarium and the Royal Botanic Gardens was guest speaker for the evening, his subject being "A Biological Survey of Victoria". His address will be published in the Victorian Naturalist in the near future. The presentation of an inscribed spade and silver tray was made by Mr. J. Ros Garnet to Mr. Pescott on behalf of the F.N.C.V. members. Mr. Garnet gave a brief outline of Mr. Pescott's career, mentioning that he was a founding member of the National Parks Association and was a valued member of the F.N.C.V., having given much help over his many years of association with the Club.

Continued from p. 214.

At the August general meeting of the F.N.C.V., rosters for helpers at the Show will be distributed. All available help from both long-standing and new members is required, particularly during the daytime.

Sunday, 12 September—from 9 a.m. onwards—will be the day to set up the Show. This is an excellent way for new members to get to know their fellow "Field Nats." Also available at the meeting will be window cards, car stickers, and, for distribution to schools, small posters and bundles of pamphlets. Your committee is relying on your help in supplying every school in the metropolitan area with the latter.

Please make this Show known as widely as possible.

F.N.C.V. DIARY OF COMING EVENTS

GENERAL MEETINGS

Monday, 10 August—At National Herbarium, The Domain, South Yarra; commencing at 8 p.m.

1. Minutes, Reports, Announcements.
2. Nature Notes and Exhibits.
3. Subject for evening — "The Continental Drift": Dr. R. T. Forbes.
4. New Members.
5. General Business.
6. Correspondence.

Monday, 14 September—Mr. A. O. Lawrence, O.B.E., former Commissioner of the Forests Commission, will speak on "The Conservation Council of Victoria."

GROUP MEETINGS

(8 p.m. at National Herbarium unless otherwise stated)

Thursday, 13 August—Botany Group. Mr. B. Fuhrer will speak on "Seaweeds of Boag's Rocks."

Friday, 14 August — Montmorency and District Junior F.N.C. meeting in Scout Hall, Petrie Park at 8 p.m.

Wednesday, 19 August—Microscopical Group meeting.

Friday, 28 August—Hawthorn Junior F.N.C. at 8 p.m. in Hawthorn Town Hall.

Wednesday, 2 September—Geology Group Meeting.

Thursday, 3 September—Mammal Survey Group meeting at 8 p.m. in the Arthur Rylah Research Centre — corner of Brown St. and Stradbroke Ave., Heidelberg.

Friday, 4 September—Preston Junior F.N.C. meeting at 8 p.m. in Rechabite Hall, 281 High Street, Preston.

Monday, 7 September—Marine Biology and Entomology Group meeting at 8 p.m. in small room next to National Museum Theatre.

Thursday, 10 September—Botany Group meeting. Mr. L. Fell will speak on "Some Western Australian Wildflowers and Their Ecological Setting." Election of Office-bearers.

Friday, 11 September — Montmorency and District Junior F.N.C. meeting in Scout Hall, Petrie Park at 8 p.m.

F.N.C.V. EXCURSIONS

Sunday, 9 August—Botany Group excursion to Warrandyte. Details from Mr. Kleinecke, 25-2415.

Sunday, 16 August—Healesville. The coach will leave Batman Avenue at 9.30 a.m. Fare \$1.50. Bring one meal and a snack.

Saturday, 29 August to Sunday, 6 September—Wyperfeld National Park and Little Desert Camp Out. The plan is to travel to Wyperfeld on Saturday remaining there until Wednesday, then travelling to Broughtons Waterhole in the Little Desert where we will meet local Naturalists who are planning that section of the trip. Members will be responsible for their own camping gear and meals but a larger tent will be taken where meals may be eaten if necessary or members can gather if the night is cold. Food supplies can be replenished during the week. The coach fare will be \$18.00 and any fares outstanding should be paid to the excursion secretary as soon as possible. Cheques should be made out to Excursion Trust. At time of writing, there are several vacancies, so those still wishing to go should contact the excursion secretary. Camping gear can be hired very cheaply if required. Coach leaves from outside Gas and Fuel Corp. building, Flinders Street, at 8 a.m. A picnic lunch should be brought. **Luggage may be left at McKenzie's depot, 53 Barkers Road, Kew, on the previous day to departure.**

Saturday and Sunday, 17-18 October—Weekend excursion to Castlemaine with the Bendigo F.N.C. Coach and Motel accommodation has been booked and the weekend should cost approximately \$14.00 plus picnic meals for Saturday and Sunday.

Field Naturalists Club of Victoria

Established 1880

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.

Patron:

His Excellency Major-General Sir ROHAN DELACOMBE, K.B.E., C.B., D.S.O.

Key Office-Bearers, 1970/71

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Mr. T. SAULT

Vice-Presidents: Mr. J. STRONG; Mr. P. CURLISS

Hon. Secretary: Mr. D. LEE, 15 Springvale Road, Springvale (546 7724).

Hon. Treasurer: Mr. D. E. McINNES, 129 Waverley Road, East Malvern 3145 (211 2427).

Hon. Editor: Mr. G. M. WARD, 54 St. James Road, Heidelberg 3084.

Hon. Librarian: Mr. P. KELLY, c/o National Herbarium. The Domain, South Yarra 3141.

Hon. Excursion Secretary: Miss M. ALLENDER, 19 Hawthorn Avenue, Caulfield 3161. (52 2749).

Subscription Secretary: Mrs. N. E. LEWIS, 1 Billing Street, Springvale 3171 (546 6469).

Magazine Sales Officer: Mr. B. FUHRER, 25 Sunhill Av., North Ringwood, 3134.

Book Sales Officer: Mrs. J. STRONG.

Group Secretaries:

Botany: Mrs. R. WEBB-WARE, 29 The Righi, South Yarra (26 1079).

Microscopical: Mr. M. H. MEYER, 36 Milroy Street, East Brighton (96 3268).

Mammal Survey: Mr. P. HOMAN, 40 Howard Street, Reservoir 3073.

Entomology and Marine Biology: Mr. J. W. H. STRONG, Flat 11, "Palm Court", 1160 Dandenong Rd., Murrumbeena 3163 (56 2271).

Geology: Mr. T. SAULT.

MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available, and other activities are indicated in reports set out in the several preceding pages of this magazine.

Rates of Subscriptions for 1970

Ordinary Members	\$7.00
Country Members	\$5.00
Joint Members	\$2.00
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Junior Members receiving Vict. Nat.	\$4.00
Subscribers to Vict. Nat.	\$5.00
Affiliated Societies	\$7.00
Life Membership (reducing after 20 years)	\$140.00

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All subscriptions should be made payable to the Field Naturalists Club of Victoria, and posted to the Subscription Secretary.



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F.N.C.V. DIARY OF COMING EVENTS

GENERAL MEETINGS

Monday, 14 September—At National Herbarium, The Domain, South Yarra; preceded by an Extra-ordinary Meeting at 7.55 p.m. to consider the admittance of Wychitella Forest Protection League as an Affiliate.

1. Minutes, Reports, Announcements.
2. Nature Notes and Exhibits.
3. Subject for evening — "The Conservation Movement in Victoria": Mr. A. O. Lawrence, former Commissioner of Forests Commission.
4. New Members.

Ordinary:

Miss M. Francis, 93 McKinnon Rd., McKinnon, 3204.
Mr C. Linnane, Flat 8, 6 Loch Street, St. Kilda, 3182. (Interest—Ornithology & Zoology.)
Mrs. J. B. Linney, Flat 18, 14 Leopold St., South Yarra, 3141. (Interest—Botany & Ornithology.)
Mr. D. J. Rogers, Central Band, R.A.A.F., Laverton, 3027.

Joint:

Mr. and Mrs. R. P. Garret, 440 Belmore Rd., Box Hill North, 3129. (Interest—Botany.)

Country:

Mr. M. T. Kaveney, 54 Pine Avenue, Mullumbimby, N.S.W., 2482.
Miss F. Poole, 134 Fitzroy Street, East Geelong, 3219. (Interest—Botany.)

Junior:

Miss Myra Holmes, 5 Victoria Street, Canterbury, 3126.

5. General Business.
6. Correspondence.

GROUP MEETINGS

(8 p.m. at National Herbarium unless otherwise stated.)

Thursday, 10 September—Botany Group. Mr. L. Fell will speak on "Some W.A. Wildflowers and their Ecological Setting". An election of Office-bearers will also be held.

Friday, 11 September—Montmorency and District Junior F.N.C. meets at Scout Hall in Petrie Park at 8.00 p.m.

Wednesday, 16 September—There will be no meeting of the Microscopical Group on this night, due to the Nature Show.

Friday, 25 September—Hawthorn Junior F.N.C. meets in Hawthorn Town Hall at 8.00 p.m.

Thursday, 1 October—Mammal Survey Group meeting at 8 p.m. in the Arthur Rylah Research Centre—corner of Brown St. and Stradbroke Ave., Heidelberg.

Friday, 2 October—Preston Junior F.N.C. meets in Rechabite Hall, 281 High St., Preston, at 8 p.m.

Monday, 5 October—Marine Biology and Entomology meeting in room next to National Museum Theatre at 8 p.m.

Wednesday, 7 October—Geology Group meeting. (See also Geology Group Excursions p. 258).

Thursday, 8 October—Botany Group. Mr. J. H. Willis will speak on "Glimpses of New Guinea Plants".

Monday, 12 October—"The Naturalists Role in a Modern World": Dr. M. Calder.

Monday, 9 November—Presentation of 1970 Natural History Medallion to Miss Jean Galbraith by Mr. R. T. M. Pescott; and an address by Miss Galbraith on "The Joy of Living".

F.N.C.V. EXCURSIONS

Sunday, 20 September—Heathcote. Leader — Mr. A. Lewis. The coach will leave Batman Ave. at 9.30 a.m. Fare \$2.00. Bring two meals.

Saturday and Sunday, 17-18 October—Weekend excursion to Castlemaine with Bendigo F.N.C. D.B.B. at the motel and coach fare—\$14.00. This should be paid to the Excursion Secretary by the end of September. Cheques to be made payable to Excursion Trust. Bring picnic lunch for Saturday. Two meals will be needed on Sunday.

26 December-3 January, 1971—Cann River (details next month).

The Victorian Naturalist

Editor: G. M. Ward

Assistant Editor: E. King



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9 September, 1970

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Front Cover:

The photograph shows one of the Mason Wasps (*Abispa ephippium?*), constructing the entrance tube to one of the many cells contained in the fist-sized red clay nest. Paralysed caterpillars are placed and sealed in each cell, an egg having first been deposited by the wasp.

Photo by Graham Pizzey.

September, 1970

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Victorian Non-Marine Molluscs – No. 1

by

BRIAN J. SMITH*

This is the first of a series of short field notes to the land and freshwater molluscs of Victoria. They are designed to give the average field naturalist some general information about the various kinds of non-marine molluscs to be found in Victoria. A single species or a small group will be described each month with notes on the general features of recognition, habitat notes and an idea of its distribution.

Genus *Victaphanta* — Large Black Snail.

Victaphanta is a genus of large, carnivorous, native snails which only occurs in the rainforests of central and south-western Victoria. It contains two closely similar species, *Victaphanta atramentaria* from the central Great Dividing Range, and *Victaphanta compacta* from the Otway area. Both these species have large black or dark brown glossy shells which are horny in texture and very fragile; adult shells are 25 to 35 mm. in diameter. They only occur in the wetter parts of the rainforest areas and are usually found buried under leaf litter or rotting logs. However, on wet, cool days they are occasionally found crawling in the open. As mentioned above they are carnivorous, catching and eating earthworms, other snails, insect larvae, etc.

The easiest way to tell the two species apart is by:

- (a) distribution — they inhabit separate areas with no overlap.

*Curator of Invertebrates.

National Museum of Victoria.

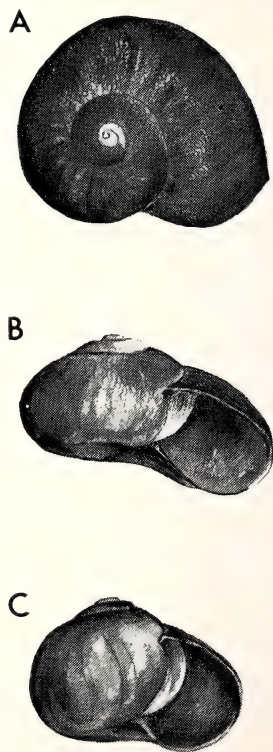


Figure 1 A. dorsal view of *Victaphanta atramentaria*;
B. aperture view of *V. atramentaria*;
C. aperture view of *Victaphanta compacta*.

- (b) body colour—*V. atramentaria* has a bright orange foot frill and secretes sticky orange mucus; *V. compacta* has an all black animal with no orange and secretes a colourless mucus.
- (c) Shell shape—the shell of *V. compacta* is smaller and more

globular than *V. atramentaria*, but you need the two for comparison to see this clearly.

Both these species have comparatively small ranges and are very susceptible to land clearing. This is especially true of *V. compacta* which is in danger of extinction by land clearing operations in the Otways.

More About Mud-mats (*Glossostigma* spp.)

by

J. H. WILLIS

In the *Victorian Naturalist* 87: 168 (June, 1970), I recorded an unusual subalpine occurrence of the tiny, characteristically inland herb *Glossostigma drummondii*. The identification was, unfortunately, hasty and the presence of only *two* (instead of four) stamens in the almost microscopic flowers had been overlooked; the flower stalks also are shorter than the leaves, *not* longer as in typical *G. drummondii*. It is now believed that the little mud-plant found last January by Mr. Keith Rogers, in boggy parts of Forlorn Hope Flat (at about 4,000 ft. alt.), is not *G. drummondii* Benth. at all but *G. spathulatum* Arn. — a completely new record for Victoria!

The latter species is presumed to range very widely from S.E. Australia to North Queensland, Ceylon, India and tropical Africa, but is not yet reported from New Guinea. It was first described, and figured in colour, by Dr. Richard Wight in W. J. Hooker's *Botanical Miscellany* 2: 101, suppl. t. IV (1830) under the name *Microcarpaea spathulata*. Wight had seen this plant only twice, near Madras and Negapatam along the Carnatic coast; but his name has

been rendered illegitimate because he included in synonymy the names *Peplidium capense* Spreng. and *Limosella diandra* L.—according to modern nomenclatural requirements, he should have taken up Linnaeus's epithet *diandra* and made the new combination "*M. diandra* (L.) Wight." On the other hand, Arnott's publication (1836) of the name *Glossostigma spathulatum* can be justified, even though his epithet was adopted from that of the illegitimate combination *M. spathulata*—q.v. Article 72 in the 1966 International Code of Botanical Nomenclature. In Dr. H. J. Eichler's *Supplement to J. M. Black's Flora of South Australia* (ed. 2): 281 (1965), *G. spathulatum* is claimed to be an illegitimate name (an opinion not shared by the present writer) and is replaced by *G. diandrum* (L.) O. Kuntze; this latter name has also been adopted in Nancy T. Burbidge and Max Gray's recent *Flora of the A.C.T.* 323 (1970), wherein the species is newly recorded for the Canberra region and assigned an astonishing altitudinal range—from the bank of Lake Burley Griffin to Mt. Gingera (at 6,000 ft.).

It is quite uncertain that the name *G. diandrum* can be applied to any Australian populations of *Glossostigma*. *Limosella diandra* L. was based upon a (presumptively) South African collection in such poor condition that even Thunberg and later Bentham could not be sure of its identity, and subsequent floras of the Cape Province have all omitted *Glossostigma*. Can we apply *G. spathulatum* to Australian mud-mats having a 3-lobed calyx and only 2 stamens? Differences are certainly apparent between Wight's original plate (with good analytical details) and the little mountain plant discovered by Mr. Rogers in the Forlorn Hope Flat area of N.E. Gippsland. For instance, Wight depicts a

rosy-pink corolla about twice as long as the calyx, with relatively slender corolla-tube and numerous ovules, whereas the Victorian plant has a broad corolla-tube with lobes hardly exceeding the calyx and a few-seeded ovary. Australian floras describe the corolla of *G. spathulatum* as blue, not pink, but this may be due to a colour change during drying—as with the so-called “Blue” *Boronia* (*B. caerulescens*), where flowers are bluish only in the dried condition. For the present, *Glossostigma spathulatum* remains the most acceptable name for our little bistaminate mud-mat of the mountains; but the need for a competent revision of the whole genus, backed up by extensive field studies, is equally obvious.

* * * *

Rediscovery of *Pomaderris obcordata* in Victoria

To Mr. Keith Hatley, National Park Ranger at Kiata, goes the credit for a recent botanical discovery of great interest. In July, 1969, while examining part of the Little Desert near the South Australian border (in Moray Parish) he collected a flowering fragment of what has proved to be *Pomaderris obcordata* Fenzl, not seen in Victoria for the past 112 years; the shrub was about 3 ft. high and growing in stony ground. *P. obcordata*, which ranges from Western to South Australia, is not infrequent on Eyre and Yorke Peninsulas, Kangaroo Island and the S.E. coast (Guichen Bay, etc.); it is unique among eastern representatives of this genus by virtue of its triangular, prominently 2-lobed leaves about $\frac{1}{2}$ inch long. In Melbourne

Herbarium is an old collection made by C. Wilhelmi in January, 1857, and labelled simply “Grampians.” Baron von Mueller included the species in his *Key to the System of Victorian Plants* p. 257, fig. 61 (1886-88); but the record has been completely overlooked since that date — it was omitted from both editions of the F.N.C.V. plant census (1923 and 1928) and from Ewart's *Flora of Victoria* (1931).

Its re-appearance in the far west of our State is paralleled by that of the equally remarkable *Spyridium spathulatum* (Big Desert, Aug. 1965) and strengthens the case for a permanent reserve in this sector of the Little Desert.

—J. H. WILLIS

Changes in the Nomenclature of Two Endemic Tasmanian Plants

by

WINIFRED M. CURTIS

SPYRIDIDIUM OBCORDATUM (Hook. f.) W. M. Curtis, comb. nov.

Cryptandra obcordata Hook. f.
Flor. Tasm. 1: 71 (1855);

Spyridium serpyllaceum (Reissek
& F. Muell.) F. Muell. *Fragm.*
Phyt. Aust. 3: 80 (1862) — nom.
illegit.

The new combination is needed because, under the name *Spyridium serpyllaceum*, Mueller included both *Trymalium serpyllaceum* Reiss. & F. Muell. in *Linnaea* 29: 280 (1858) and *Cryptandra obcordata* Hook. f. *Flor. Tasm.* 1: 71 (1855) in synonymy.

OLEARIA TASMANICA W. M. Curtis, nom. nov.

Eurybia alpina Hook. f. in *Lond. J. Bot.* 6: 106 (1847)

Olearia alpina (Hook. f.) W. M. Curtis *Student's Flor. Tasm.*: 304, 463 (1963), non *Olearia alpina* J. Buchanan in *Trans. New Zeal. Inst.* 19: 215 (1887).

When making the new combination, *Olearia alpina*, I regrettably overlooked Buchanan's prior use of the name for a New Zealand species.

Readers' Nature Notes and Queries

The Editor has exhausted the supply of these notes. It is up to readers to rectify this matter.

These notes come from Ellen Lyndon, in Leongatha, Victoria.

Fleas on Bush Rat

On 2/2/70 a party walking near a creek in bush country at Yinnar South, near Morwell, were examining the thick matted ground cover of Twining Glycine, when a small rodent ran out of it. One man was able to cover it with his palm and pick it up, holding it upside down for inspection. It seemed weak but struggled and squeaked and bit vigorously at the nearest finger. The chubby face, longish tail and pale feet indicated, to me, the Allied Rat, *Rattus fuscipes*, a juvenile specimen about half adult size. The odd thing about this rat was its extraordinary infestation with large fleas. These at once began to vacate the fur, scramble off the hand and drop to earth. We are wondering if

the small rat was weakened by so many fleas, or, alternately, are fleas attracted to an animal that is perhaps sick and weakening from other causes?

Unusual Nesting Material?

Along the beach at Venus Bay, near Tarwin Lower in South Gippsland, we picked up a small cupped nest, probably that of the White-fronted Chat. It was largely composed of long black wiry strands of vegetable origin, not unlike horsehair in appearance. No one in the party recognised this material so a sharp eye was kept open for anything of a like nature. It was eventually traced to clumps of the Knobby Club rush, *Scirpus nodosus*, from which the sand had eroded, leaving the hairy root systems exposed and loose. Woven into the shape of the nest made a tough and resilient framework.

The Turn of the Tide

On Monday, 8th June, 1970, the F.N.C.V. had the pleasure of being addressed by Mr. Ian G. Wallis of the Monash University Westernport Bay Research Team. After showing a color documentary, Mr. Wallis spoke on the problems associated with the rapid industrial development taking place around Westernport Bay and its effects on the natural balance now maintained in ecological and hydraulic systems.

The following is a précis of the address, taken from notes supplied by Mr. Wallis, to whom the writer expresses appreciation and acknowledgement.

Westernport Bay is a large tidal estuary, where, over a long period of time, two delicately balanced systems have evolved to form the pleasant area of islands, sandy beaches, rocky foreshores, salt marshes and mangrove swamps of to-day.

This will be altered and possibly totally destroyed in less than ten years if further detailed research is not undertaken to determine the tolerance of pollution on the environment. The Monash University Team has considered the changes made as part of industrial development in terms of disturbance to the two existing natural systems.

During the winter months, sand and crushed shells are removed from the beaches by storms and wave action to form sand bars. These are returned to rebuild beaches in milder weather. The currents on the shores and in the channels, keep sediment moving in and out of the Bay with each tidal cycle and so a balance is achieved.

Dredging of channels and reclamation of mudflats, could cause serious disturbance to this balance. The shape of the Bay could be altered, resulting in a decrease of the volume of water moving in and out of the Bay and thus changing its flushing characteristics. Tests conducted to estimate the effluent disposal have shown that a build-up will occur, as currents sweep it back into the channels.

Disturbance to the hydraulic system will in turn affect the ecological balance. This system, wherein plants and animals are dependent on each other for food and shelter, if destroyed at one point, could lead to total destruc-

tion of the whole. The food source of many forms of marine life would disappear if the mudflats were eroded. The teeming millions of minute animals living in the mud, provide food for higher forms of life, which are in turn, food for fish. The fish are in turn the food for seals and penguins, living at the Bay entrance.

The mangrove areas are very important in the ecological scheme, as they stabilise mudbanks. Mangroves are easily destroyed by the effects of dredging and oil slicks. An example of this can be seen in the deterioration of the Williamstown beaches, where the last mangroves disappeared in 1956.

Mr. Wallis stated that Westernport Bay would cease to be a recreational area if immediate steps were not taken to safeguard the Bay. He suggested that French Island should be retained as a reserve, as it is the last example of natural heathland, and any causeway construction to the island could create problems with flushing. Consideration should be given to the discharge of effluent into the ocean and not the Bay, through the South West Sewerage System.

If our assets are to be protected, a large capital outlay will be required, creating further problems of the rise in cost of products. The industries and local Government bodies in the area have shown interest in the pollution problem, but are inclined to take the view that "you show us that effluent is causing damage and we'll do something."

Suggestions were made by Mr. Wallis that natural history clubs could be of assistance by conducting botanical surveys and gathering any relevant information relating to the environment.

The 26-minute color documentary "The Turn of the Tide," which was produced by Mr. Wallis, illustrated the effects of pollution in the Bay. The film also depicted the Research Team conducting tests on the effluent dispersal, the movement of sediment and correlating their findings.

Mr. Wallis is to be congratulated on the fine quality of the film and it should do much to promote public interest in the preservation of Westernport Bay.—Edna King.

The Distribution of Epiphytes on Beech (*Nothofagus cunninghamii*) Trees at Mt. Donna Buang, Victoria

by

DR. H. ASHTON* AND R. McCRAE*

The vertical zonation of bryophytes, lichens and ferns was sampled on very recently fallen Beech trees at 3,000 ft. in 1963 on Mt. Donna Buang, Victoria. The site is wet, frequently mist-laden, and being on a steep eastern slope, it receives little direct sunlight on hot summer afternoons.

Beech trunks are frequently gnarled and corrugated and the original plates of bark from younger stages may adhere between multiple fissures. There are therefore many microhabitats for epiphyte establishment, especially amongst the convoluted roots, burls and buttress-like swellings. Some aspect differences were observed on the tree trunks in more exposed positions, but these were not specifically studied.

1. *The relationship between tree girth at breast height and butt epiphytes.*

In general the number and profuseness of epiphyte species increases with the size of the trunk. Four to five species were found on trees less than 1 ft. g.b.h. up to heights of 6 ft. However, on trees of 8-10 ft. girth this number was doubled (Table 1). This relationship is probably due to the greater diversity of habitat on the thicker-barked, larger and older trees, but it could also be related to the minimal area for the epiphyte communities.

In general the larger and more frondose liverworts were found at

lower levels on the trunk where fern establishment was also more common. The finger fern, *Ctenopteris billardieri* was found at the lower levels and, also, occasionally the soft tree-fern *Dicksonia antarctica*. The smaller trunks were often surrounded by dense ground ferns (*Polystichum proliferum*) which cast considerable shade around the butt. The large tree bases, on the other hand, tended to be relatively free of ground ferns. There is therefore a large variation in local butt microclimate. The quantity of trunk-flow, its seepage down furrows and its retention in the thicker bark and humus accumulation in crevices are added complications to the microhabitat.

In general the butt communities were dominated by *Dicranoloma billardieri*, *D. menziesii*, *Bassania adnexa* and *Plagiochila fasciculata* with the lichens *Sticta glabra* and *Stereocaulon ramulosum* forming conspicuous patches. The liverwort *Tylimanthus tenellus* was often quite common at the lower levels. The lower strata of the epiphyte communities consisted of low mats of varying density of *Chiloscyphus echinellus*, *Lepidolaena magellanica*, *Frullania rostrata* and *Hypnum cupressiforme*.

2. *Vertical distribution of epiphytes.*

(a) Large trees.

The vertical distribution of epiphytes was recorded in small quadrats at 1-2 ft. intervals along the

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south to west aspects of the trunk and branches of a tree 95 ft. in height and 8 ft. in girth at breast height. The length of the quadrats was 1 ft. but their width diminished with the taper of the tree from 18 inches at the butt to 9 inches in the mid-trunk, 3 inches in the crown and $\frac{1}{4}$ inch in the fine branches. Cover of species was estimated on the Braun Blanquet* scale of + to 5.

The results in Figure 1 show that the frondose butt-community was dominated by thick mats of the liverworts *Bazzania adnexa*, *Tylimanthus tenellus*, and the moss *Dicranoloma billardieri*. The epiphyte zone of the trunk space consisted of a complex mat and lichen community dominated by *Frullania rostrata*, *Hypnum cupressiforme* and the lichens *Sticta glabra*, *Parmelia pertusa* and *P. billardieri*, *Sphaerophorus tener* and *S. melanocarpa*.

The change to this community roughly corresponded to the level of the ground-fern canopy. Within the mat and the lichen zone there is a gradation of both the species and their abundance. In this zone *Cladia aggregata* tends to occur at lower levels and *Metzgeria furcata* at higher levels. Some feet below the commencement of the crown, small plants of the moss *Leptostomum inclinans* also occur.

The crown region microhabitats are complicated by the accumulation of humus in the angles of the branches. On the trunk, main branches and especially the branch angles, the epiphyte community is dominated by cushions of *Leptostomum inclinans* (up to 3-6 inches in diameter) and mats of *Hypnum cupressiforme*. The lichens *Parmelia physodes*, *P. billardieri* and *P. pertusa* are also common. This community

continues on to the moderately small stems 3-4 inches in diameter on both the main trunk and the lateral branches. On the latter the *Leptostomum* cushions are situated on the upper side and the fronds of *Hypnum* trail down either side in long whips.

On the finer branches the community becomes more open and consists of tufts of *Leptostomum inclinans* and *Uloa membranacea* with small colonies of *Parmelia pertusa* and *Usnea australis*. On the ultimate branches only sparse, simple, erect thalli of *Usnea australis* occur with occasional crustose lichens, *Lecidea cinnibarina* and *Phyllectella* sp.

(b) Small trees.

Small trees 10-23 ft. in height show a similar pattern to the large trees, but in the small tree the zonation of species is greatly foreshortened. Small colonies of frondose bryophytes occurred up to 5 ft. on the 23 ft. tree and 2 ft. on the 2 ft. tree. The trunk community again is composed of *Frullania rostrata*, *Hypnum cupressiforme* and *Sticta* species. *Leptostomum inclinans* cushions are not common on the crowns of the 23 ft. tree and are absent from the 10 ft. tree. The fine branch and twig zone contains *Usnea australis* and *Hypnum cupressiforme* and "white-wash" crustose lichens (*Phyllectella*) (Fig. 2). In general, the conspicuous *Parmelia* spp. and *Uloa* components of the tall crowns of the forest canopy are missing.

(c) Corticolous succession.

The earliest colonizers are found on 3-year-old branches and are chiefly *Usnea australis* and "white-wash" crustose lichens. At this stage the *Usnea* thalli are only 1 mm. high.

* (+ = 0-1%, 1 = 1-5%, 2 = 5-25%, 3 = 25-50%, 4 = 50-75%, 5 = 75-100%).

On 5-6 year branches they are 2-5 mm. in height and are associated with small *Parmelia pertusa* and *Ulotrichaceae* colonies. From about 10-13 years *Usnea* is branched 10-15 mm. high and associated with *Parmelia billardieri* and *P. lugubris*. From 13-18 years on thicker branches, the crown community is well developed with the occurrence of *Hypnum cupressiforme* and *Frullania rostrata* (Fig. 3). *Usnea* and the crustose lichens virtually disappear. In general, the lower branches establish a crown-type community a few years earlier than the upper branches and the horizontal branches develop a much more vigorous community than the vertical branches. The rate and extent of development is likely to be greatly affected by the local microclimate in the crown. Succession to cushion moss communities on horizontal branches usually only occurs on the upper surface. The lower areas are shaded and drier and bear only simple algal or soredial lichen communities. It is possible that the cushion community dominated by *Leptostomum inclinans* becomes unstable with age and cannot fully recolonize the vertical trunk once the earlier crown branches have fallen. If this is so, it could help to explain the development of a lower and more open mat community dominated by *Hypnum* and *Frullania* in the clear bole region. The bark flakes of the original young stem may still adhere to the mature trunk and may bear crustose lichens such as *Pertusaria* which may be relics of the earlier communities. It seems that succession in the true sense does not proceed beyond the branch stage since new surfaces are being constantly created by expanding bark furrows of the trunk.

The Relationship between Epiphytes and Environmental Factors:

The documentation of the Beech tree environment within the forest would have been of great interest. However, it was only possible to investigate a few relevant factors.

Bark thickness on the large tree ranges from 8-9 mm. on the butt to 5-6 mm. on the mid trunk, to 3-4 mm. in the crown and 1-2 mm. in the small branches. The twigs have a bark thickness of only 0.2-0.8 mm. The moisture content of the outer bark in winter was near saturation at 70-79% O.D.W. in the crown and 53-69% at the butt. It is likely, however, that the lower bark would have a greater moisture storage due to its greater thickness. In addition, the greater shade, lower temperatures and windspeeds at lower levels in the forest trunk space would be conducive to the development of a marked gradient of humidity.

In order to test the relative resistance of various crowns and butt species to desiccation, several fronds and thallus pieces of different species were suspended over concentrations of sulphuric acid such as to provide relative humidities of 0, 25, 50, 75% at 6°, 20° and 32°C. The epiphytes were exposed to these conditions for 3, 12 and 24 hours then re-moistened and their condition assessed qualitatively on a 3 point scale from green, partly brown to completely brown. The results showed that the species from the butt habitat — *Bazzania adnexa*, *Cyathophorum pennatum*, *Dicranoloma billardieri*, *Lepidolaena magellanica* and *Siicta glabra* were much more sensitive to desiccation than the trunk and crown species *Hypnum cupressiforme*, *Frullania rostrata*, *Leptostomum inclinans* and *Cladonia aggregata*.

Even desiccation at 75% discriminated between the two groups. At 50% R.H. damage to both groups increased but the differences remained very marked. Damage at 25% was greater again, but beyond this no increase occurred in the aggregate assessment.

Temperature during desiccation had a marked effect on the damage sustained. At 32°C damage was distinctly greater than at 20°, but little difference occurred at 20° and 6°C. Damage increased greatly from 3 to 12

hours desiccation thereafter little further damage occurred.

The results indicate that *Cyathophorum pennatum* is the most sensitive species tested, followed by *Lepidolaena magellanica*, *Bazzania adnexa*, *Dicranoloma billardieri* and *Sticta delisea* in that order. The most resistant species tested was *Cladia aggregata* followed by *Leptostomum inclinans*, *Frullania rostrata* and *Hypnum cupressiforme*.

It is likely that resistance to desiccation is an important feature in the

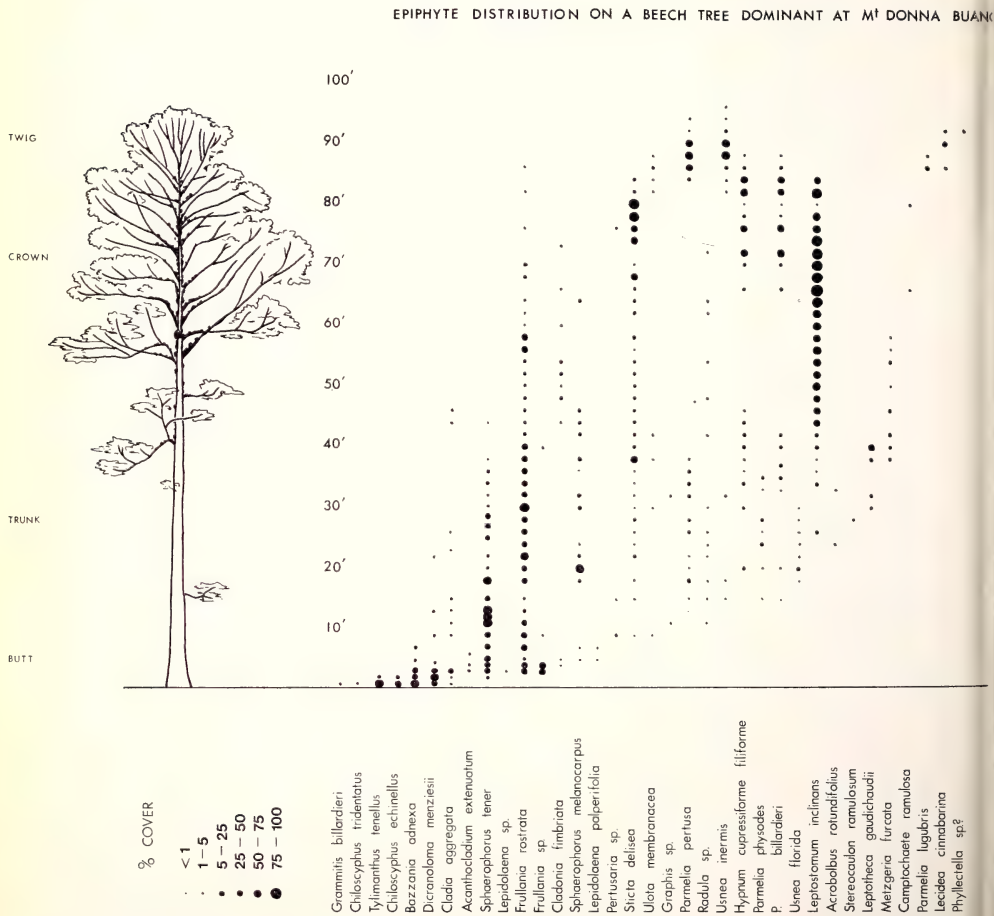


Figure 1.

ecology of epiphytes. The larger frondose species are unable to transport water internally from the substrate and are reliant on free water and the high humidity of the air for their continued survival. The killing or continual damaging of the larger species could permit the smaller and often more resistant species to compete and survive. Epiphytes are often sensitive indicators of microclimate; further research on their behaviour would be very rewarding.

SUMMARY

The epiphytic communities on Beech trees (*Nothofagus cunninghamii*) can be divided into butt, trunk, crown and twig communities. Within and between any zone, gradations of species occurrence and

profusion can be observed. Corticolous succession can be postulated for the development of communities on branches. A desiccation experiment suggested that marked differential resistance occurs between species normally found on the butt and trunk-crown regions. Such differences in behaviour could be decisive factors in the zonation of epiphytes on the trunk-space of the forest.

Acknowledgements

We gratefully acknowledge the help with identifications of lichens by Mr. R. Filson, Liverworts by Mrs. A. E. Hodgson and mosses by Dr. I. Stone. The senior ecology class of 1963 of which one of us was a member (R. McCrae) assisted with some of the field work.

BRANCHES

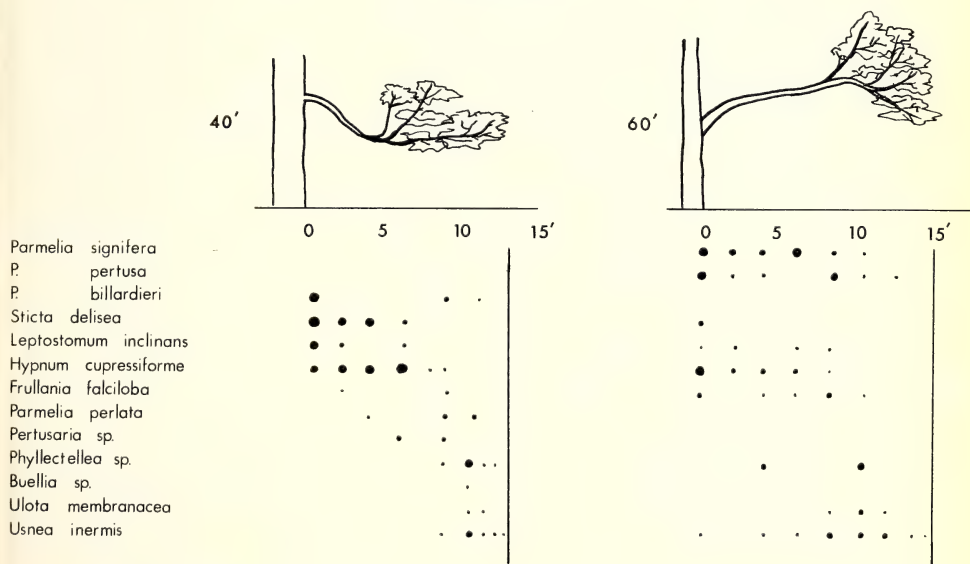


Figure 2.

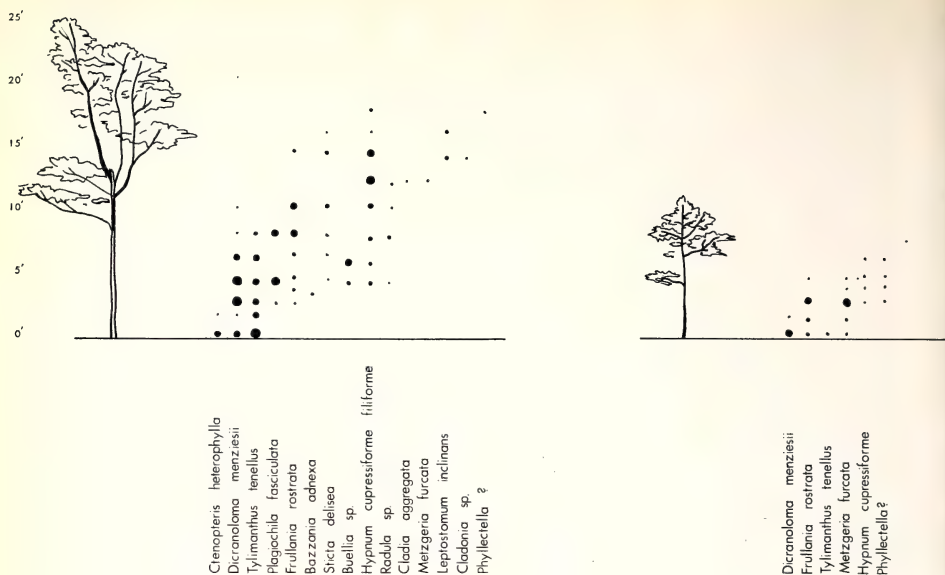


Figure 3.

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GEOLOGY GROUP EXCURSIONS

Saturday, 5 September—To Eden Park Fossil Beds. Leader: Mr. Barry Cooper. Leave Lalor Station at 2.10 p.m.

Sunday, 11 October—To Heathcote and district (previously advertised for 9th August.)

Sunday, 8 November—To Kinglake. Leader: Mr. George Carlos.

Transport is by private car. Spare seats are usually available for those without their own transport. **Unless otherwise indicated** excursions leave from the western end of Flinders Street Station opposite the C.T.A. Building at 9.30 a.m.

TABLE 1
Epiphytes on Beech Butts of different size.

Ht. GBH	0 - 2 ft.					4½ - 6 ft.				
	0-1	3-4	6-7	8-9	>10	0-1	3-4	6-7	8-9	>10
<i>Tylimanthus tenellus</i>	x		x	x						
<i>Dicranoloma menziesii</i>	x	x		x			x		x	
<i>Dicranoloma billardieri</i>	x		x	x			x	x	x	
<i>Acrobolbus rotundifolius</i>		x	x	x	x	x	x	x		x
<i>Hypnum cupressiforme</i>						x				
<i>Sticta Glabra</i>			x		x	x	x	x	x	
<i>Sphaerophorus melanocarpa</i>				x		x	x	x	x	
<i>Plagiochila fasciculata</i>		x	x	x			x	x	x	
<i>Frullania rostrata</i>		x			x		x	x	x	x
<i>Cladia aggregata</i>		x		x	x		x	x		
<i>Bazzania adnexa</i>			x	x	x				x	
<i>Ctenopteris billardieri</i>			x	x	x					
<i>Chiloscyphus echinellus</i>			x		x			x		
<i>Radula</i> sp.							x			x
<i>Stereocaulon ramulosum</i>					x		x			
<i>Lepidolaena palperifolia</i>								x	x	
<i>Sphaerophorus tener</i>									x	x
<i>Lepidolaena magellanica</i>				x	x					
<i>Lepicolea scolopendra</i>									x	
<i>Lophocolea australis</i>									x	
<i>Pertusaria valata</i>										x
<i>Metzeria</i> sp.										x
<i>Rhizogonium miniodes</i>										x
<i>Cladonia squamata</i>					x					
<i>Dicksonia antarctica</i>					x					

Footnote for table 2 (pages 260-261).

ORDER OF SPECIES:

Crown species

- (a) *Hypnum cupressiforme*
- (b) *Frullania rostrata*
- (c) *Leptostomum inclinans*
- (d) *Cladia aggregata*

Butt species

- (e) *Cyathophorum pennatum*
- (f) *Dicranoloma menziesii*
- (g) *Lepidolaena magellanica*
- (h) *Stereocaulon tener*
- (i) *Bazzania adnexa*

TABLE 2

Damage to Epiphytes at Different Temperatures and Relative Humidities.

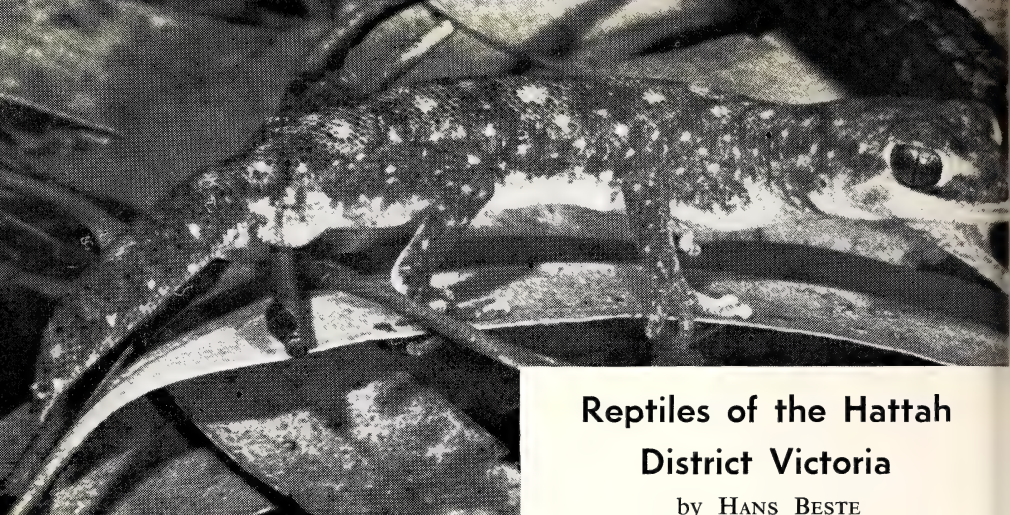
x Damage Slight or none.

xx Damage Moderate.

xxx Dead.

Species (a) - (i) : see footnote page 259.

Rel. Humidity Temp.	Time	0% R.H.		25% R.H.		50% R.H.		75% R.H.		100% R.H.	
		Crown	Butt	Crown	Butt	Crown	Butt	Crown	Butt	Crown	Butt
32° C	3 hours	(a) xx	(e) xxx	xx	xxx	xx	xxx	x	xx	x	x
		(b) xx	(f) xxx	x	x		x	x	x	x	x
		(c) xx	(g) xxx	x	xx	x	xx	x	xx	x	x
		(d) x	(h) xx	x	x	x	x	x	x	x	xx
			(i) xxx		xx		xx		x		x
	12 hours	(a) xx	(e) xxx	xxx	xxx	xxx	xxx	x	xxx	x	x
		(b) xx	(f) xx	xxx	xxx	xxx	xxx	x	x	x	x
		(c) x	(g) xx	xx	xx	xxx	xxx	x	xx	x	x
		(d) xx	(h) xxx	xxx	xxx	xxx	xxx	x	x	xx	xx
			(i) xx		xxx		xx		x		x
	24 hours	(a) xx	(e) xxx	xx	xx	xx	xxx	x	xxx	x	x
		(b) xx	(f) xx	xx	xx		xx		xx	x	x
		(c) x	(g) xx	x	xxx	x	xx	x	xxx	x	x
		(d) x	(h) xx	xx	xx	x	x	x	xx	xx	xx
			(i) xx		xx		xx		xx		x



Reptiles of the Hattah District Victoria

by HANS BESTE

A total of fifty-two days was spent by the writer and an additional party of two in the Hattah region of N.W. Victoria, during three fieldtrips between 16 September and 4 December 1969. A particular effort was made to locate and identify as many reptiles as possible, and although 26 species were found in a rather restricted area, these are by no means the only reptiles that have been found in that part of the state.

The areas studied were a 180,000 acre leasehold at Hattah, the environs of Hattah, and a freehold of 1,300 acres on the River Murray.

The first two areas can be des-

cribed roughly as mallee with open plains, and the third as River Red Gum flood plains. The weather was mostly mild during the time spent in the area, which would have contributed to the fact that reptiles were sometimes rather scarce, and that some species that are known to be in the area were not sighted at all.

The elapine generic names are those as adopted by P. A. Rawlinson (1966) i.e. (Kinghorn 1956) and subsequent changes in scincidae (pers. comm. Rawlinson). Not all of the species found have common names, but wherever possible a common name is given, without following any particular author.

The Title Block illustrates the gecko *Diplodactylus tessellatus*.

CHELONIA

CHELYIDAE

- Chelodina expansa* (Broad-shelled Tortoise)
Chelodina longicollis (Long-necked Tortoise)
Emydura macquarrii (Macquarrii Tortoise)

Area where found
 (See Fig. 1)

3
3
3

SQUAMATA

LACERTILIA

AGAMIDAE

- Amphibolurus barbatus* (Bearded Dragon)
Amphibolurus fordi (Mallee Dragon)
Amphibolurus muricatus (Jacky Lizard)
Amphibolurus pictus (Painted Dragon)
Physignathus gilberti (?)

1, 2, 3
1
1, 2
1, 2
1

GEKKONIDAE

<i>Diplodactylus strophurus intermedius</i>	2
<i>Diplodactylus tessellatus</i>	3
<i>Gehyra variegata</i> (House Gecko)	1, 2, 3
<i>Diplodactylus damaeus</i> (Beaded Gecko)	1, 2
<i>Phyllodactylus marmoratus</i> (Marbled Gecko)	3

PYGOPODIDAE

<i>Delma fraseri</i> (Fraser's Legless Lizard)	1
<i>Lialis burtonis</i> (Burton's Legless Lizard)	1, 2

SCINCIDAE

<i>Ablepharus boutonii</i> (Wall Lizard)	3
<i>Ablepharus lineocellatus</i>	1, 2, 3
<i>Egernia inornata</i> (Desert Skink)	1
<i>Ctenotus lesueurii</i> (Striped Skink)	1, 2
<i>Ctenotus</i> sp? (a specimen of an undescribed species was collected)	1
<i>Tiliqua occipitalis</i> (Western Bluetongue)	1
<i>Tiliqua rugosa</i> (Shingleback)	1, 2, 3

VARANIDAE

<i>Varanus gouldii</i> (Gould's Sand Goanna)	1, 2, 3
<i>Varanus varius</i> (Lace Monitor)	3

OPHIDIA

ELAPIDAE

<i>Demansia textilis</i> (Common Brown Snake)	1, 2, 3
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TYPHLOPIDAE

<i>Typhlops australis</i>	2
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Acknowledgements:

The author wishes to thank the following people for the help that they have given him and his party, while doing the field study and by helping with the identification and naming of some of the specimens.

Mr. and Mrs. H. McArthur, for giving kind permission to camp on their properties and for the assistance which they gave us during this time.

Mr. P. A. Rawlinson, for helping with the identification and naming of some of the difficult specimens.

Mr. J. Coventry of the National Museum, Melbourne, for suggesting methods of finding certain species and without whose help this list may well have been shorter.

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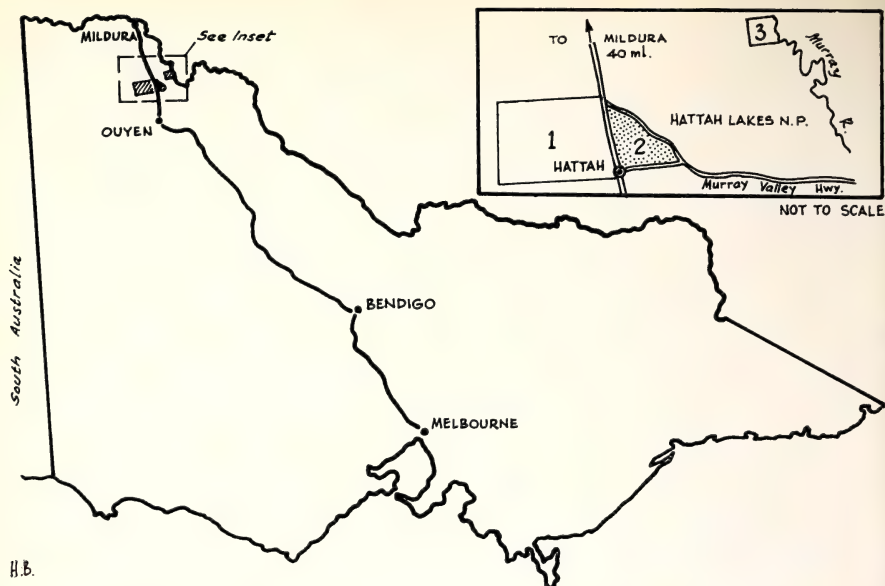


Figure 1. Map showing areas 1, 2, 3.



Plate 1.

Dragon: *Physignathus gilberti*.

Plate 2. Gecko: *Diplodactylus damaeus*.

Plate 3. Dragon: *Amphibolurus fordi*.

Plate 4. Gecko: *Diplodactylus strophurus intermedius*.

Plate 5. Blind-Snake: *Typhlops australis*.



A *Diuris* Hybrid from the Melbourne Area

by

P. UHLHERR

A hybrid of *Diuris* — probably *D. longifolia* x *D. pedunculata* — was discovered by Mr. and Mrs. D. Dunn in the late Spring of 1967. It was found again in 1968 and 1969 in three separate localities of the Dandenong Ranges and the Mornington Peninsula. The author was able to study plants in the field in two of these localities during 1968 and 1969. The flowers do not conform to any species known to the author. The conclusion that a hybrid is involved is by no means certain and is based on floral characteristics and on the abundance of the two assumed parents in all the localities and the relative scarcity of the plant under discussion. Usually about 3 to 6 plants have been found in clusters among a large number of *D. longifolia*. In one area, three such clusters were found. The *D. pedunculata* was normally some hundreds of feet removed. This could possibly indicate that the latter species is the pollen donor while the former is the recipient.

The flowers of the hybrid are among the most impressive of the genus, the spreading habit of the petals giving the flowers a very large appearance. The floral characteristics are more or less intermediate between those of the supposed parents, as can be seen from Figure 1. Some variability has been observed, but not more than in *D. pedunculata* itself.

The labellum has two rather obscure basal ridges, which are slightly pubescent or glandular (to a lesser

degree than in *D. pedunculata*), as shown in Figure 2, K and L. The side lobes have irregular margins as in *D. pedunculata*, but the ratio of their length to that of the mid-lobe is much greater than is that species and agrees more nearly with the ratio found in *D. longifolia*. (Figure 1; D, E, F). The mid-lobe may be entire except for a small notch in the tip — less pronounced than in *D. longifolia* — or it may be rather irregular near its apex. This last feature is not found in either parent.

The petals are longer than in either parent, and the ratio of claw length to lamina length is very similar to that found in *D. pedunculata* (1/4 to 1/5), being somewhat less than in *D. longifolia* (1/2 to 1/3) (Figure 1: G, H, J.). The petals are almost horizontally spreading as in *D. pedunculata*. However, they do not point forwards as in that species, but rather are slightly recurved towards the ovary (Figure 1: A, B, C).

The lateral sepals are $1\frac{1}{2}$ to 2 times as long as those of either parent and are not at all petaloid. They have inrolled margins and terminate in fine points (Figure 2; M, N, O). The dorsal sepal resembles that of *D. pedunculata* in shape, but is somewhat wider and longer. It is reflexed away from the column to a greater extent than in that species. The margins near the apex may be irregularly toothed or entire, and the tip is apiculate (Figure 1; G, H, J.).

The column of the hybrid resembles that of *D. longifolia* in that the wings and the anther both exceed

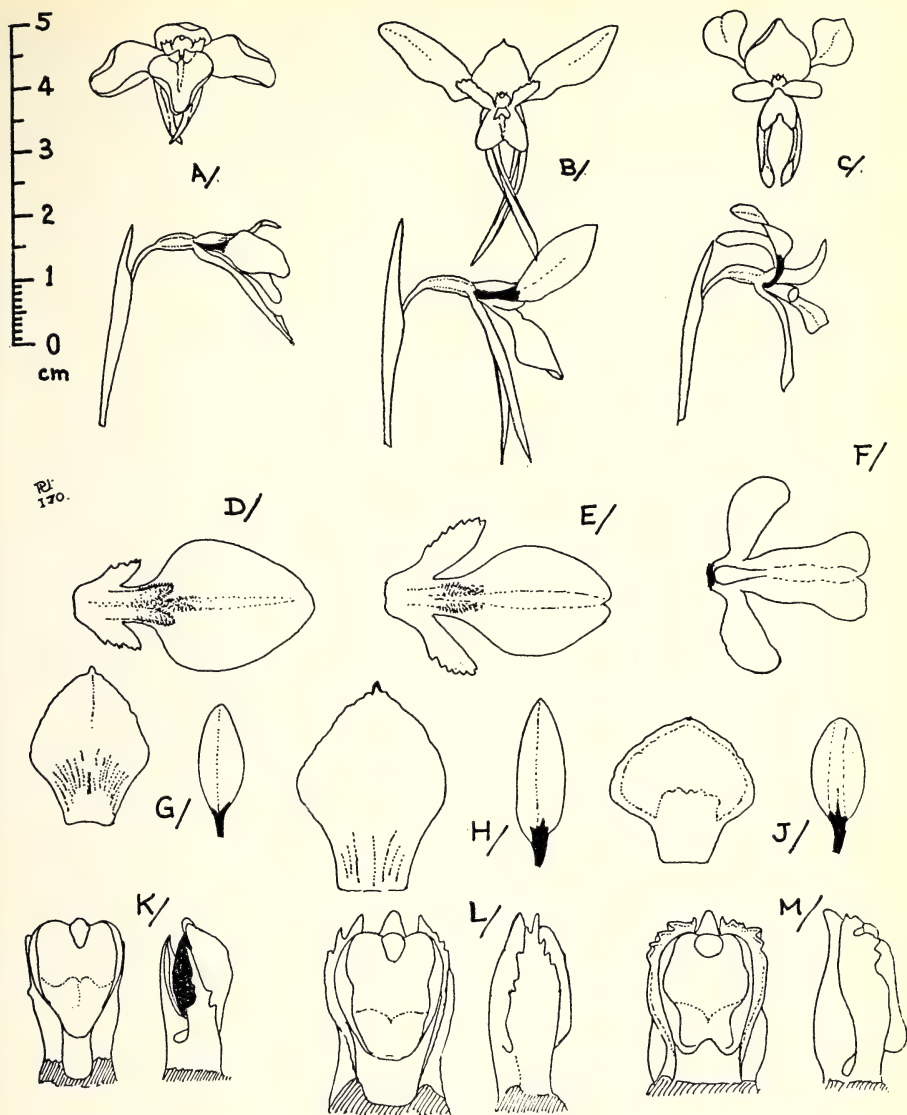


Figure 1

flower front and side (X1)

labellum flattened (X2)

dorsal sepal flattened (X2) }
petal flattened (X1) }

column front and side (X6)

D. pedunculata
(left)

A

D

G

K

Hybrid
(centre)

B

E

H

L

D. longifolia
(right)

C

F

J

M

the rostellum in height, whereas in *D. pedunculata* both wings and anther are lower than the rostellum. However, the stigma shape is closer to that of *D. pedunculata* in that the protruding swellings at the base are lacking (Figure 1; K, L, M). The shape of the anther differs from that of both parents and is rather narrower (Figure 2; A, B, C). The pollinia, with viscidia, of the two parent species are shown in Figure 2; D, G and F, J. The pollinia of the hybrid could not be removed from the anther cap, which was rolled quite tightly around the very fragile, mealy pollen masses. The pollen was, however, easily separated from the viscid disc. This seems to indicate that perhaps the hybrid is incapable of pollination except with pollen from the parent species. The pollen of hybrid flowers certainly cannot be removed by an insect. The stigma, however, appears to be quite normal, in that it is viscid and has a tube to the ovary, which contains apparently normal ovules. The hybrid pollen masses, enclosed in the

anther cap, are shown in Figure 2; E and H.

The flower colour is yellow with a few rather pale, reddish-brown streaks or blotches. The dorsal sepal is streaked near its base, while the petals have broad but pale central streaks. The labellum mid-lobe is blotched, while the side lobes are streaked. The lateral sepals are wholly green.

Some plants were seen with flowers having a diameter of 55 mm.—considerably larger than either parent; however, most flowers measured about 40 mm. Plant height and robustness are as for *D. longifolia*. Also the underground organs resemble those of *D. longifolia*, which has a number of long, thick and fleshy roots radiating from the base of the stem. The point of attachment is constricted and extremely fragile. The rather large, more or less globular tubers of *D. pedunculata* are absent. Instead, the greatly elongated tubers are almost horizontally disposed (Figure 2; P, Q).

The flowering period is mid-October to early November.



Plate 1.

Diuris hybrid, centre;
with *D. pedunculata*,
left; and *D. longifolia*
right.

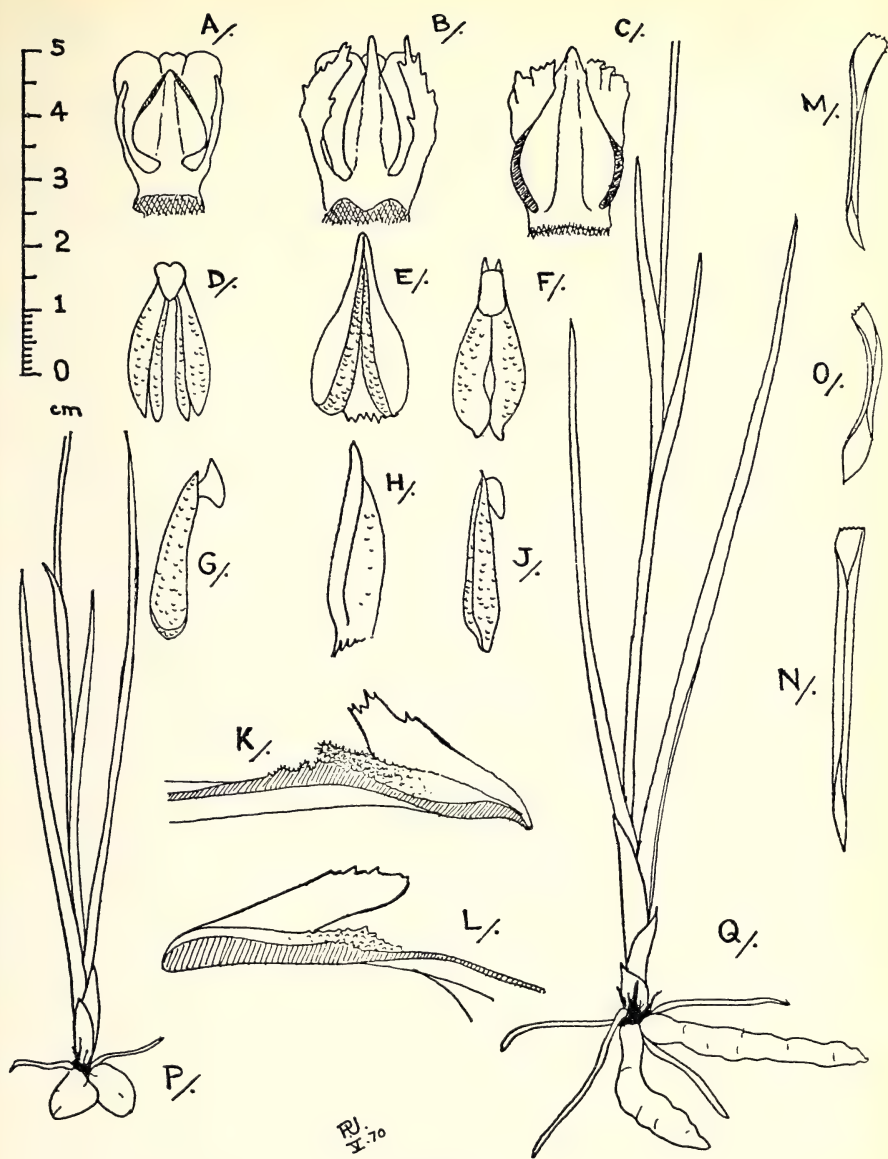


Figure 2

column rear (X6)

pollinia front and side (X9)

labellum base in longitudinal section (X5)

lateral sepal (X1½)

plant (X½)

D. pedunculata

A

D/G

K

M

P

Hybrid

B

E/H

L

N

Q

D. longifolia

C

F/J

—

O

Q

Marsupials Caught in Pollen Traps at Wilson's Promontory

by

J. H. HOPE* AND G. S. HOPE†

During a study of pollen fallout in Wilson's Promontory National Park, several small marsupials were unintentionally caught in pollen traps. Since there are few recent records of small mammals in the National Park, it is worth noting these occurrences. Also, the unusual method of trapping leads us to suggest that naturalists in Victoria may be able to enlarge the number of records of mammal distribution by the simple expedient of collecting old bottles.

The pollen traps used in the vegetational study each consisted of a beer bottle, the base of which had been cut off with a diamond saw. The neck of the bottle was corked and the bottle placed upside-down, either partly buried in the soil or attached to a supporting frame, so that the open base of the bottle was uppermost and about 6 to 18 inches above ground level. The bottles were filled with a glycerine solution to trap pollen blown by wind or precipitated by rain. Mercuric chloride was also added to prevent the growth of fungi. The pollen traps were placed in fifteen different plant communities on Wilson's Promontory, and were emptied and refilled at monthly intervals over a period of two years. The pollen trapping project was carried out while G. S. Hope was a research student in the School of Botany, University of Melbourne; it is reported in Hope (1968).

After the pollen traps had been in position for about nine months, three marsupials were found in two different traps. The traps were then covered with half inch mesh wire netting to prevent any further captures. However, two more marsupials were caught during the following year inside traps covered with mesh.

The first two marsupials caught both came from the same trap, which was situated in *Eucalyptus baxteri* - *Casuarina pusilla* tree heath at the start of the track leading from the main road to Lillypilly Gully. These were collected on 13 December, 1966, which means that they must have fallen into the trap sometime during the month preceding this date. Unfortunately both these specimens were lost before they had been identified. On 16 February, 1967, a specimen of *Antechinus stuartii* was found in a pollen trap in *Eucalyptus baxteri* low sclerophyll shrub woodland about 200 yds. east of Tidal Overlook. It is now in the National Museum of Victoria (NMV), registered as C9058.

All the traps were covered with mesh in March, 1967, but on 15 April, 1967, another *Antechinus stuartii* (NMV No. C8724) was collected from a pollen trap in *Eucalyptus obliqua* forest about 250 yds. from the picnic site at Lillypilly Gully. The last marsupial caught was a specimen of *Sminthopsis leucopus*

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(NMV No. C8818). It was found on 16 December, 1967, in a pollen trap in *leucopogon parviflorus* - *Leptospermum laevigatum* open shrubland on a coastal dune seaward of Cottars Lake, which lies at the south-eastern part of the Yanakie Peninsula, just north of Darby River.

Wakefield and Warneke (1967) noted that *Antechinus stuartii* is widely distributed in both wet and dry sclerophyll forest throughout southeastern Victoria, so the discovery of this species in dry sclerophyll forest and woodland at Wilson's Promontory is not surprising. Marlow (1957) states that the habitat of *Sminthopsis leucopus* is sclerophyll forest. The pollen trap on the dune at Cottars Lake was at least one mile away from the nearest forest or woodland vegetation, but this species is known to inhabit at least one unforested island in Bass Strait, West Sister Island.

Our discovery of the ability of these two species to squeeze through narrow mesh to get inside the pollen traps parallels the records of many small mammals found trapped inside empty bottles in the British Isles. At least ten different species of mammals, mainly shrews and small rodents, have been collected from discarded bottles there (Morris and Harper 1965). Some bottles contained more than one animal, the record being held by a champagne bottle which contained the remains of fifteen individuals of four different species. It seems likely that the mammals are caught in these bottles because of the greater ease of entering a bottle than leaving by the neck, especially if the inside of the bottle is wet and slippery. Any remnants of the original contents of a bottle may act as bait,

or the circular opening of the bottle mouth may attract mammals because of its resemblance to a burrow entrance. In the case of the pollen traps, the marsupials may have been attracted by the liquid inside and have fallen in while attempting to drink. The fact that two of the five specimens managed to enter pollen traps through the wire mesh suggests that the trapping was not accidental, but due to a positive effort on the part of the marsupials.

Although pollen traps are not common in the bush, empty bottles certainly are. Those most likely to trap animals are ones hidden in thick vegetation, and when these are exposed by bushfires they may be worth examining for mammal remains. In Britain many first records of species in some areas have been obtained from bottles, and the method has also produced information of mammal distribution in suburban areas. The ease with which bottles can be examined, combined with the large numbers thrown away in Australia, make this method worth investigating here.

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Field Naturalists Club of Victoria

General Meeting

10 August, 1970

The meeting was opened by the President, Mr. T. Sault, who welcomed approximately 80 members and visitors present.

Mr. D. McInnes informed the meeting of the Nature Show arrangements and called for volunteers to assist at the Show. Attendance rosters were distributed and cards, pamphlets, car stickers, etc. made available for advertising purposes.

Exhibits:

Mr. A. Morrison — A collection of aboriginal artefacts. Sandstone grinding stones and quartzite scrapers from the George Gill Range, N.T. Hammer stones and choppers from Mt. Connor, N.T.

Mr. P. Matches — Rusty Pomaderris (*P. ferruginea*), Correa (*C. glabra*), empty cases of gall insects from the Warrandyte area.

Mr. H. Haase — Garden cultivated specimens of 2 gums (*E. crenulata* and *E. kruseana*), Cootamundra Wattle (*A. baileyana*) showing galls. Mr. Haase remarked on the number of insects infesting native plants this year and attributed this to the scarcity of birds, especially brown thornbills, their numbers apparently reduced by predatory domestic animals.

Mrs. W. Seamons — A weevil identified as Coleoptera Fam. Curculionidae, shown under microscope.

Mr. Bishop — An Ascidian shown under the Club Binocular Microscope.

Mr. T. Sault — Pond life containing Ostracods, water fleas, worms. This was from tank at home.

Mr. D. McInnes — Aquariums purchased for use at the Nature Show and for general use by members thereafter.

This years Natural History Medallion was displayed and the Secretary announced that it had been awarded to Miss Jean Galbraith who would be presented with it at the November meeting.

Copies of a Bird List of Churchill Park compiled by S. L. Bliss, a Bird List of the Little Desert and a pamphlet on the Mallee Fowl were tabled. These publications have been published by the National Parks Authority.

The death of an honorary member of the club, Miss Margaret Wigan, was

announced. Miss Wigan was for many years an active club member and known to all as a warm-hearted and kindly person. Mr. J. Willis and Miss J. Blackburn both spoke of Miss Wigan's interest in birds, her trip to the Abrolhos Islands and her membership of the National Parks Association since its inception. She was the only honorary member of that Club.

Another honorary member of the club, Miss Chisholm, of Macedon, is now an inmate of the Alexandra Home at Castlemaine and members wishing to visit are welcome.

Miss M. Butchart, who has been in hospital for an eye operation is reported to be recovering very well.

The Secretary read a copy of a letter sent to the Minister of Lands regarding the preservation of the Mt. Napier area. Further correspondence on this matter indicates that there is a good possibility of this area being preserved.

Mrs. E. Lyndon of Leongatha wrote of a display by the Vermin and Noxious Weeds Board depicting the Wombat as vermin. She also sent along a ridiculous advertisement for a pest control firm in which spider webs were said to destroy paintwork.

A letter of appreciation was received from the parents of Antonia Bartlett of Croydon thanking an unknown Club member for the assistance rendered their daughter after she had been thrown from a horse.

The President again reminded members of the resignation of the Secretary, Mr. D. Lee, in December, 1970 and requested nominations.

Mr. Weston spoke of the proposed formation of a Conservation and Restoration Society for the Heidelberg-Doncaster area and members are invited to attend a meeting on 28 August. Mr. R. Johnson will speak on "Birds of the Area." The venue is not known but can be obtained from Mr. Johnson.

The speaker for the evening was Dr. R. T. Forster who gave an interesting talk on "The Continental Drift". His talk explained the controversial Gondwanaland Theory and was well illustrated with diagrammatic sections and maps. Members showed their interest in the subject by asking Dr. Forster many questions and joining in discussion of the points raised.

Botany Group Meeting

13 August, 1970

The subject was a study of Boag's Rocks area by Miss Mary Morgan, Mr. Tom Sault and Mr. Bruce Fuhrer.

Mr. Sault was the first speaker. He discussed the geology of the rock platform. There is a calcareous formation extending from Cape Schanck to beyond the Bellarine Peninsula. Here Boag's Rocks are found. The age of the formation is not known, but is within the last 1,000,000 years. The speaker explained the action of the waves and tides on the cliffs and rocks. It is more difficult for algae to become established on flat rocks than in cavities and fissures. In these the greatest numbers are found growing. Three ways were described, and illustrated with good slides, in which the cavities and fissures arise. There is a rising profile of the coastline at Boag's Rocks and Mr. Sault made the suggestion that the area of this profile is possibly the edge of the tidal wave area of the ancient mouth of the River Yarra.

After this, Miss Mary Morgan spoke of the Ecology of the Shore and Dune Area, dividing this into sand (both on the beach and on some of even the highest dunes), dune shrub area, secondary shrub area after clearing, grassed

area and raised rock platform. She supplied comprehensive lists of the plants for each area. As well as lists of vegetation, there were tables of the temperatures, both average and maximum and minimum for each month and the average for the year and the average rainfall (since 1880). Another table was of wind analysis, direction and speed in knots. Here the average taken over the years 1962-1965 was used. Each member was supplied with a typed copy of these lists, with a diagram of the area and the tables.

The third member of the team, Mr. Bruce Fuhrer, spoke mainly of the specimens of algae (seaweeds), which had been washed up on the beach. Owing to adverse weather conditions, he had been unable to collect in the rock pools, etc. He had a good supply of specimens, supplemented by Mr. Sault's beautiful pressed specimens.

The Chairman thanked the team (which had been assisted on some occasions by Mrs. Matches and Miss Lester) for their excellent work and lecture, which had been of great interest to the more indigent (on this subject at any rate) members of the group.

Next Botany Group Meeting, 10 Sept. Mr. Fell, West. Aust.

Western Victoria F.N.C. Association Reports for 1969

MARYBOROUGH

President: Rev. E. H. Deutscher. Secretary: Mrs. Eileen Courtney.

Membership: Adult 54, Junior 7. *Meets First Monday, High School.*

The club has had a stimulating and useful year and the main activities have been varied. Publicity was given prior to the 1969 Duck opening season, followed by newspaper articles and photographs showing the slaughter of protected birds on Opening Day. Opposition, which has been partially successful, has been voiced to local forest grazing leases.

Preservation of Maryborough's Green Belt:

The town's organizations were circularised on this matter and a good deal of support promised, subsequently a panel of members put the Club's viewpoint to the local Rotary Club.

Conservation petitions, particularly the Little Desert, were solidly supported. A successful natural history exhibition was conducted during the Wattle Festival. Members of the B.O.C. were shown many areas of interest during a weekend visit, and the Junior Group, Landscape Section of the National Trust were conducted during the spring around the best wildflower areas. The project of preparing and planting the Wildflower Garden of S.S. 2828 was continued during the winter.

MID MURRAY F.N. TRUST

President: Mr. Bert Curtis Secretary: Miss G. Willoughby
Membership Adult 25, junior 11.

Monthly meetings have been very interesting with nature films and observations. Visiting speakers and Trust members have presented the following subjects—

Mrs. I. Kenneady, 'Australian opals', Mr. I. Caldwell 'Life of the Orchard Spider', Mr. Cleary 'Kruger National Park', Mr. Keith Hatley 'Kiata National Park', Mr. B. Wait 'Insects', Mr. A. Poppins 'Peru' and Mr. H. Thomas 'Local Aboriginal Tribes'. Excursions took us into mallee country, including a campout at Hattah; others to river country; and to Gypsum flats and Lake Boga granite quarry, where some large specimens of smoky quartz crystals were found. An intensive mallee fowl mound count was conducted over 3,000 acres of mostly virgin country in the Parish of Wandown. 100 mounds were found, and of these about 20 were being worked. Each was numbered and records are being kept and it is hoped this area, which abounds in mallee bird and plant life will become a Sanctuary. The Mid Murray Field Naturalists Trust Report, 1969, has included the recorded list of 210 different birds seen in the Swan Hill Shire and the first of our herbaria counts.

Fortnightly nature notes, supplied by club members, are printed in the local paper and these are well received throughout the district.

PORTLAND

President: Miss Ina Watson Secretary: Mr Colin Skaer
Membership Adult 51, Junior 6 *Meets Second Friday, Town Hall.*

Club meetings have been well attended and the syllabus has included many interesting items. Mr. Kurtze again made his Museum available for his talk on 'Collecting Minerals'. Dr. W. M. Moore of Mt. Gambier introduced us to the world of 'Beetles'; Mr. Jack Wheeler spoke of New Guinea, Western Australia and Lawrence Rock. Mrs. J. Watson, Marine Biologist, gave an interesting account of a biological expedition to Pearson Island, off the S.A. coast. Mr. Len Robinson spoke on 'Birds' and Miss G. Bowker 'Life History of the Mutton Bird'. A film by the late Mr. Crosbie Morrison, taken in Central Australia, with his personal commentary was brought to us by Mrs. Crosbie Morrison. Mrs. Mellblom gave an illustrated talk on her trip to Northern and Western Australia; Mr. B. Bell, Horsham, Victorian Representative Y.F.C., spoke on a trip to Europe, and Mr. Cliff Beaglehole gave an insight into his field work 'Tabulating Flora on the Grid System'. February's meeting was held at Bridgewater Bay, with a beach and cliff search with subsequent identification of the specimens found, and Miss Watson gave an illustrated talk on the life history and banding of seagulls. Outings were conducted to various reserves and sanctuaries and the Mt. Richmond National Park Tower was officially opened by Dr. L. H. Smith and named the Noel Learmonth Tower. Geelong F.N.C. members were in Portland for a weekend and were taken to a number of interesting areas. Much work has been done in conjunction with the W.V.C.C. to preserve the Lower Glenelg and Little Desert as National Parks.

STAWELL

President: Mr. I. R. McCann Secretary: Mr. N. S. Bennett
Membership Adult 29, Junior 5. *Meetings Fourth Monday (Feb-Nov.) Tech. School.*

The Club continues to be most active in all conservation matters and the J. J. Kingston Memorial Wildflower Sanctuary was completed during the year. The opening ceremony was performed by Dr. A. N. Christensen, Vice President, Native Plants Preservation Society at a large gathering of WVFNCA members, who were at Stawell for the Annual Meeting.

Two outings have been held each month, one full day and one half day, and the Club has been represented at the three WVFNCA meetings. Places visited included Pomonal tunnel, Mt. Dryden, Panrock Ck., Barkley Gap and Redbank caves, Mafeking, and Kiata.

SUNRAYSIA R.N. TRUST

President: Mr. John Feild Secretary: Mr. H. Thomas.
Membership 107 adults, 7 Junior.

1969 marked the 20th anniversary of our organization and the highlight of the year was undoubtedly our November meeting, which coincided almost exactly with the inaugural meeting of the Club on 18 November, 1949. Seven of those present at the inaugural meeting attended the 1969 meeting:

These included our first President, Mr. C. Lang, our first Vice President, Mr. L. Chandler and our first Secretary/Treasurer Mr. A. West. Over 50 members were present and it was altogether a memorable gathering.

Our chief preoccupation during the year has been with the compiling of the proposed constitution designed for the expansion of the WVFNCA into a Victorian Naturalists' Union. The ultimate fate of this document is to be decided at Portland in April next, and we await the outcome with much interest.

Like a number of other Clubs, our membership figures are causing some concern. At the close of 1969 we had a total of 107 financial members, and, although some outstanding subscriptions have since been paid, our membership is still less than it was the previous year. This decline is a serious matter, not only where our own Club is concerned, but with Clubs overall, and it is something that must be looked at very closely if the present drift continues. The reasons for the drift seem to be complex and it may be that eventually the WVFNCA (or the VNU, if it materializes), rather than the individual Clubs, will have to tackle the problem.

WARRNAMBOOL

President: Mrs. K. Shrader Secretary: Mrs. S. W. Alford
Membership Adult 43, Junior 9 *Meets Fourth Wednesday, C.W.A. Rooms.*

The Club has been active in the fight for conservation in various areas throughout the year, and in our own particular area, it appears we have been successful in our efforts to have 2,000 acres in the Sherbrooke River pine plantation proclaimed a Reserve.

WIMMERA

President: Miss D. Armstrong Secretary: Miss A. Jordan
Membership 12. *Meets Third Thursday (Feb-Nov) at Kiata Hall.*

Our Club, although membership is small, is very keen, and the monthly meetings are well attended. This year, circumstances have limited our excursions, but in September, the WVFNCA meeting was held at Kiata National Park and our club members were pleased to be the hosts for this meeting. Members who acted as guides under the leadership of Ranger Mr. Keith Hateley were able to show the visitors not only the interesting features of the National Park itself, but also other areas of the Little Desert. Guest speaker was Mr. W. Middleton, Director of the Wail Nursery, whose intimate knowledge of the Little Desert made his talk of great interest. A splendid film—'The Life Cycle of the Wanderer Butterfly' was presented by Mr. Chapman of Geelong.



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Geology: Mr. T. SAULT.

MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available, and other activities are indicated in reports set out in the several preceding pages of this magazine.

Rates of Subscriptions for 1970

Ordinary Members	\$7.00
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F.N.C.V. DIARY OF COMING EVENTS

GENERAL MEETINGS

Monday, 12 October — At National Herbarium, The Domain, South Yarra; preceded by an Extra-ordinary Meeting at 7.55 p.m. to consider the admittance of Wychitella Forest Protection League as an Affiliate.

1. Minutes, Reports, Announcements.
2. Nature Notes and Exhibits.
3. Subject for evening — "The Naturalist's Role in a Modern World": Dr. M. Calder.
4. New Members. (See next month).
5. General Business.
6. Correspondence.

Monday, 9 November—1970 Natural History Medallion presentation to Miss Jean Galbraith.

GROUP MEETINGS

(8 p.m. at National Herbarium unless otherwise stated)

Thursday, 8 October—Botany Group. Mr. J. H. Willis will speak on "Glimpses of New Guinea Plants".

Wednesday, 21 October—Microscopical Group.

Friday, 30 October—Junior meeting at Hawthorn Town Hall at 8 p.m.

Monday, 2 November—Entomology and Marine Biology Group meeting in room next to National Museum Theatre at 8 p.m.

Wednesday, 4 November—Geology Group.

Thursday, 5 November—Mammal Survey Group Meeting, at Arthur Rylah Research Centre at 8 p.m.

Friday, 6 November—Preston Junior F.N.C. meets in Rechabite Hall, 281 High Street, Preston.

Thursday, 12 November—Botany Group. Miss H. Aston will speak on "Botanical Terms".

Friday, 13 November—Montmorency and District Junior F.N.C. meeting in Scout Hall at Petrie Park at 8 p.m.

F.N.C.V. EXCURSIONS

Saturday and Sunday, 17-18 October—Weekend excursion to Castlemaine with the Bendigo F.N.C. The coach will leave Flinders Street from outside the Gas and Fuel Corporation at 8 A.M. Bring a picnic lunch and two meals for Sunday. Any money still owing on this excursion should be paid to the excursion secretary as soon as possible.

Sunday, 18 October—Maranoa Gardens. Leader: Mr. A. J. Swaby. Meet at main gate at 2.30 p.m.

6, 7, 8 November—Botany Group weekend at Wilsons Promontory. The coach will leave Melbourne at 6 p.m. on Friday evening from outside Gas and Fuel Building, and return Sunday. Members will need sheets, towels, etc., and food. There is a store at Tidal River. Bookings should be confirmed by the October group meeting. There may be a few spare seats in the bus available to members not in the group but they would need to arrange their own accommodation.

Saturday, 26 December—Sunday, 3 January—Cann River. A coach has been chartered and hotel accommodation booked for this period. The coach will remain with the party for use on day trips, the fare will be approximately \$24.00 including day excursions and members will pay individually for accommodation which was quoted at \$5.50 for dinner, bed and breakfast, lunch can be obtained for 60 cents.

Tuesday, 3 November—President's Picnic to the Eildon District. The coach will leave Batman Avenue at 8.45 A.M. Fare \$2.00. Bring two meals.

The Victorian Naturalist

Editor: G. M. Ward

Assistant Editor: E. King



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Front Cover:

The New Holland Mouse (*Pseudomys novaehollandiae*) photographed in its habitat by Hans Beste. (See leading article).

October, 1970

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First Record of the New Holland Mouse (*Pseudomys novaehollandiae* (Waterhouse, 1843)) in Victoria

J. H. SEEBECK*† AND H. J. BESTE*

It has been decided to use a series title for all contributions to this Journal from the Mammal Survey Group. The article entitled "Mammals of the Riddell District" which appeared in the July 1970 issue carried the series title "Native Mammals in Victoria" and was Number IV in that series. Previous contributions, un-numbered, were:

"The Mammal Fauna of Darlimurla."

Vol. 85, No. 7, July 1968.

"Whale Strandings at Port Fairy, Victoria."

Vol. 85, No. 11, Nov. 1968.

"A Mammal Survey of Stockman's Reward."

Vol. 86, No. 2, Feb. 1969.

It has been decided to alter the series title to "Mammal Survey Group Contributions", and the article in this month's journal, "First Record of the New Holland mouse (*Pseudomys novaehollandiae* (Waterhouse, 1843)) in Victoria", by J. H. Seebeck and H. J. Beste appears under the series title "Mammal Survey Group Contributions — V".

INTRODUCTION

The New Holland mouse has been recorded as a living animal only from New South Wales. The species was known from only five modern specimens until recently, when specimens were collected at Ku-ring-gai Chase National Park, near Sydney, in December 1967 (Mahoney and Marlow 1968) and at Port Stephens, north of Newcastle, in February 1968 (Keith and Calaby 1968). Sub-fossil remains are reported from the Buchan district, eastern Victoria (Wakefield 1960, 1967). Further sub-fossil remains, possibly of this species, in Victoria and Tasmania are reported by Mahoney and Marlow (l.c.). *Pseudomys novaehollandiae* (Waterhouse) has now been collected at the Mornington Peninsula in Victoria, and this constitutes the first record of the species as a living animal in that State (See Figure 1).

DISCOVERY

In late May, 1970, members of the Mammal Survey Group of the Field Naturalists Club of Victoria carried

out a brief survey of freehold bushland about three miles east of the township of Tyabb, 35 miles south-east of Melbourne (Lat. 38° 16' S., Long. 145° 13' E.). In one area, south of Yaringa Road, one trapline yielded an adult female *Pseudomys novaehollandiae*, together with several *Antechinus stuartii* Macleay and feral house mice, *Mus musculus* L. In the following week one of us (J.H.S.) re-visited the area and in two nights trapping (166 trap-nights) collected an additional twelve specimens (6 ♀♀, 5 ♂♂, 1 unsexed) of *P. novaehollandiae*. Four of these animals (2 ♀♀, 2 ♂♂) were retained. The remainder were ear-tagged with numbered fish fingerling tags and released at the sites of capture. Three of the specimens retained are lodged with the Fisheries and Wildlife Department, Victoria and have the registration numbers 5098, 5126 and 5127.

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Figure 1. *Pseudomys novaehollandiae* from Tyabb.

photo: J. Seebeck.

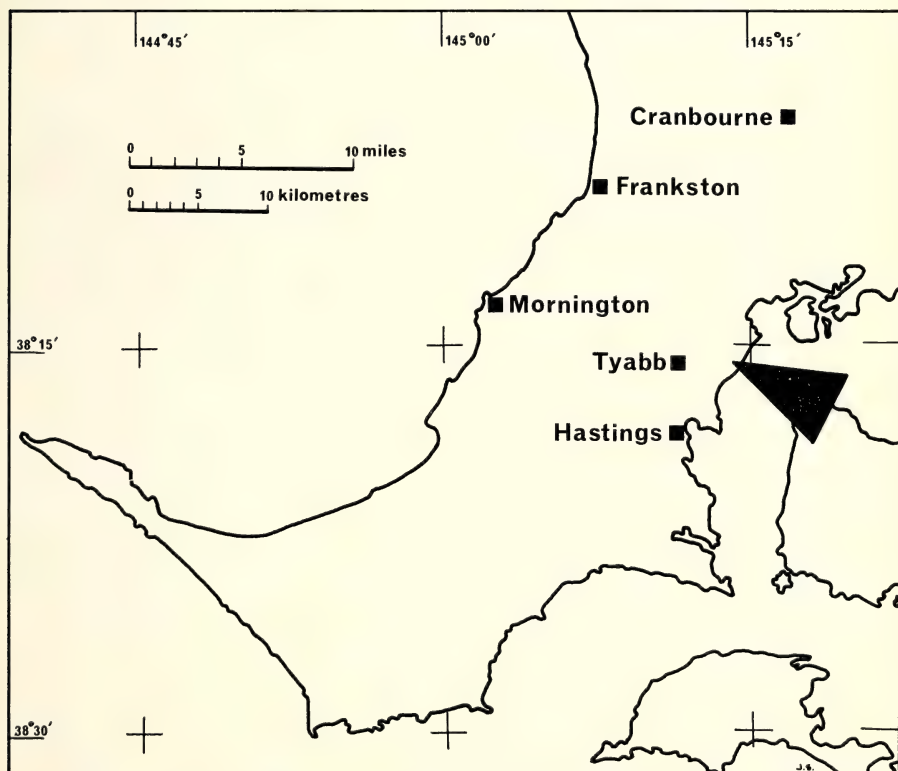


Figure 2. Part of Mornington Peninsula, showing the locality at which *Pseudomys novaehollandiae* has been discovered.

The other two specimens are lodged with the National Museum of Victoria, with the registration numbers C9578 and C9579.

A further specimen, an adult ♀, was subsequently collected at the same locality by H. J. Beste and J. Raithby. This was photographed and then released at the point of capture.

DESCRIPTION OF AREA

The map (Figure 2) shows the area in which the specimens of *Pseudomys novaehollandiae* were collected.

A. Topography and soil

This part of the Mornington Peninsula is very low lying, being mostly about 25 feet above sea level and within a few hundred yards of the sea. The coastal forest strip which now remains is bounded to seaward by a salt marsh and mangroves (*Avicennia marina*) and inland by cleared paddocks. Numerous permanent waterholes and swamps are present.

The soils are deep grey Quaternary sands overlying the Tertiary volcanics of the Western Port Sunklands (Anon. 1964, Hills 1951).

B. Climate

Climatic data is not available for this locality. Rainfall figures are, however, available for Hastings, 5 miles to the south, and these are probably similar to those of the

locality where the specimens were captured. This data shows that average rainfall is about 33 inches per annum, with highest falls in winter and early spring. (see Table 1).

The area has warm summers and cool winters. Temperature data for Mornington, 11 miles west, is given in Table 1. Temperatures in the more sheltered Tyabb area may be slightly higher than at Mornington.

C. Vegetation

The vegetation was an open dry sclerophyll forest with a dense understorey of sclerophyllous shrubs. Figures 3 and 4 show part of this habitat. The tree layer was composed mainly of narrow-leaved peppermint, *Eucalyptus radiata*, with some scattered manna gum, *E. viminalis*, reaching a height of 20-30 feet with a very open canopy. The extremely dense understorey of tall shrubs (5-7 feet) was dominated by *Leptospermum juniperinum*, with *L. myrsinoides*, *Banksia marginata* and *Leucopogon australis* scattered throughout. Isolated bushes of *Leptospermum laevigatum* and *Casuarina stricta* were occasional components of the shrub layer. Lower shrubs such as *Haloragis tetragyna*, *Dianella pogon virgatus* and *Dillwynia glaberrima* were often present and the sedge *Gahnia radula* was common in lower levels of the undergrowth,

TABLE 1.
RAINFALL Hastings, 88 year average to 1963, in inches.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1.17	1.80	2.47	2.79	3.23	3.51	3.22	3.23	3.20	3.16	2.51	2.17	33.06

TEMPERATURE — Mean maxima and minima (°F) for Mornington (35 year mean).

	Jan.	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max.	76.6	76.4	73.5	66.3	60.8	56.0	54.6	56.5	60.0	64.3	68.4	73.2
Min.	55.6	56.3	54.8	51.0	48.2	44.9	43.2	44.1	46.3	49.0	51.2	53.7



Figures 3 and 4. Part of the habitat of *Pseudomys novaehollandiae* near Tyabb.

photos: J. Seebeck.

although it occasionally reached 6 feet in height. The small grasstree, *Xanthorrhoea minor* was also found at lower levels as were *Aotus villosa* and *Epacris impressa*. The lowermost twelve inches of the undergrowth was dense, with the rope-rush *Hypolaena fastigiata*, and herbaceous plants such as *Monotoca scoparium*, *Leucorevoluta* and *Amperea xiphoclada* being conspicuous components.

The ground itself was mostly thickly covered with leaf litter, fallen twigs, mosses, lichens and large numbers of sundews (*Drosera* spp.) and members of the family Orchidaceae. Many species of fungi were also present.

The vegetation throughout this area was remarkably uniform, except where it had been disturbed by man, and all capture sites of *P. novae-hollandiae* were essentially similar in floral composition. A slight change in the botanical composition occurred near the edge of the salt marsh, with more *E. viminalis* and *Banksia* present, and with bracken (*Pteridium esculentum*) becoming an important component of the undergrowth, although this was still dominated by *Leptospermum juniperinum*. No *Pseudomys* were caught in this area but this may have been due to the limited amount of trapping.

MAMMAL DISTRIBUTION IN THE AREA

Trapping was carried out using initially, wire mesh cage traps and later, aluminium box traps, baited with a mixture of rolled oats, peanut butter and honey. Most traps were set in a series of more or less parallel lines, in a roughly rectangular area of about 6 acres. *Pseudomys novae-hollandiae* was captured in all trap lines.

From a total of 190 trap-nights, 53 mammals were trapped, a capture rate of 26.8%.

Three species (one marsupial and two rodents) were trapped in approximately equal numbers. These were *Antechinus stuartii* (18), *Pseudomys novae-hollandiae* (14) and the introduced house mouse, *Mus musculus* (17). It is probable that the house mouse is slightly more abundant in this area than indicated by the trapping results, as several traps had the bait removed by this species without being set off. A single eastern swamp rat, *Rattus lutreolus* (Gray) and two short-nosed bandicoots, *Isodon obesulus* (Shaw and Nodder) were also captured. It is difficult to assess bandicoot numbers in the area over a short term period, but almost every square yard of ground in the forest showed evidence of their feeding. The only other native ground mammals present were the echidna, *Tachyglossus aculeatus* (Shaw) whose diggings were frequently encountered, and the black wallaby, *Wallabia bicolor* (Desmarest). This latter species was not sighted within the trapping area but several wallaby skeletons were found and the large runways formed by this species in the undergrowth criss-crossed the whole of the trapping area.

BIOLOGICAL NOTES

The specimens collected at Tyabb agree very closely in pelage coloration to the description given by Keith and Calaby (1968), but comparison with skins of *P. novae-hollandiae* from New South Wales show that the Victorian specimens are darker and greyer in colour. Flesh and skull measurements of one female (Fisheries and Wildlife No. 5127) are given in Table 2, and these fall within the upper limits of the ranges quoted by Keith and Calaby with the exception that ear length is slightly greater. For comparison, the appropriate measurements of those authors are included in Table 2.

TABLE 2.

Comparative Measurements of *Pseudomys novaehollandiae*.

	Tyabb (FWD 5127♀)	Port Stephens — observed range*			
		Females		Females with worn molars	
(a) Flesh measurements		(N)		(N)	
Weight (gm)	16	32	13 - 20	9	14 - 20
Head and Body (mm)	82	35	74 - 95	10	82 - 95
Tail* (mm)	33*	32	85 - 107	9	94 - 107
Pes (mm)	21	35	20.5 - 22	10	20.5 - 21.5
Ear (mm)	18	35	15.5 - 17.5	10	15.5 - 17
*most of tail missing					
(b) Skull measurements (mm)					
Total length	25.4	33	23.2 - 25.8	9	24.0 - 25.7
Condylobasal length	20.8	35	20.6 - 23.4	10	21.9 - 23.2
Basal length	21.6	33	19.0 - 21.5	10	20.0 - 21.3
Zygomatic width	12.8	35	11.6 - 12.5	10	11.8 - 12.5
Interorbital width	3.8	35	3.5 - 4.1	10	3.5 - 3.9
Interorbital length	3.7	33	2.8 - 4.0	10	3.1 - 4.0
Interparietal width	8.8	35	6.6 - 8.4	10	7.0 - 8.3
Braincase width	11.6	35	11.0 - 12.0	10	11.0 - 12.0
Mastoid width	11.6	35	9.3 - 10.4	10	9.6 - 10.4
Nasals length	9.3	33	8.0 - 9.8	9	8.2 - 9.8
Palatal length	13.2	35	11.7 - 12.9	10	12.0 - 12.9
Left palatal foremen length	5.6	35	4.1 - 5.5	10	4.8 - 5.5
Inside m ¹⁻¹ width	2.6	35	2.3 - 2.9	10	2.6 - 2.9
Outside m ¹⁻¹ width	5.4	35	4.8 - 5.4	10	4.9 - 5.4
Bulla length	4.4	35	4.2 - 4.9	10	4.3 - 4.9
Crowns m ¹⁻³ length	4.0	35	3.4 - 3.8	10	3.5 - 3.8
Alveoli m ¹⁻³ length	4.2	35	4.6 - 4.0	10	3.7 - 3.9
Crowns m ¹⁻² length	2.8	35	2.4 - 2.9	10	2.6 - 2.9

*data from Keith and Calaby (1968).

Figure 5 shows side, ventral and dorsal views of a skull from the Tyabb colony (left) and a skull from Port Stephens (right). The Tyabb specimen shows a greater degree of tooth wear but tooth morphology is the same as in the Port Stephens specimen.

All specimens examined appeared to be adult. The females had imperforate vaginae and the nipples were not in use. Testes in all the males

were abdominal. These observations support Keith and Calaby's suggestion of a breeding season for this species.

A small series of ectoparasites, mostly fleas and ticks, were collected from the animals. These have not yet been identified. It is of interest to note that very few ectoparasites were present on *Mus musculus* from the same locality.

DISCUSSION

The north-western shore of Western Port Bay has apparently suffered little major change for many years. Fires have been mainly absent for a period in excess of thirty years and the only significant change has been in the amount of bush country cleared. These factors must have been of major significance in the survival of this colony of *Pseudomys novaehollandiae*.

The discovery of the New Holland mouse on the Mornington Peninsula highlights the need for detailed biological surveys in Victoria. The Peninsula, being so close to the metropolitan area of that State, has long been settled and the remaining bushland is now greatly dissected by rural, urban and industrial development. Major industrial expansion is now taking place along the shores

of Western Port and it is perhaps unfortunate that the New Holland mouse should have only been discovered at this time, when the remaining habitat is already being altered by the encroachment of industry.

Factors such as this make conservation of this species a difficult problem to solve.

Acknowledgements

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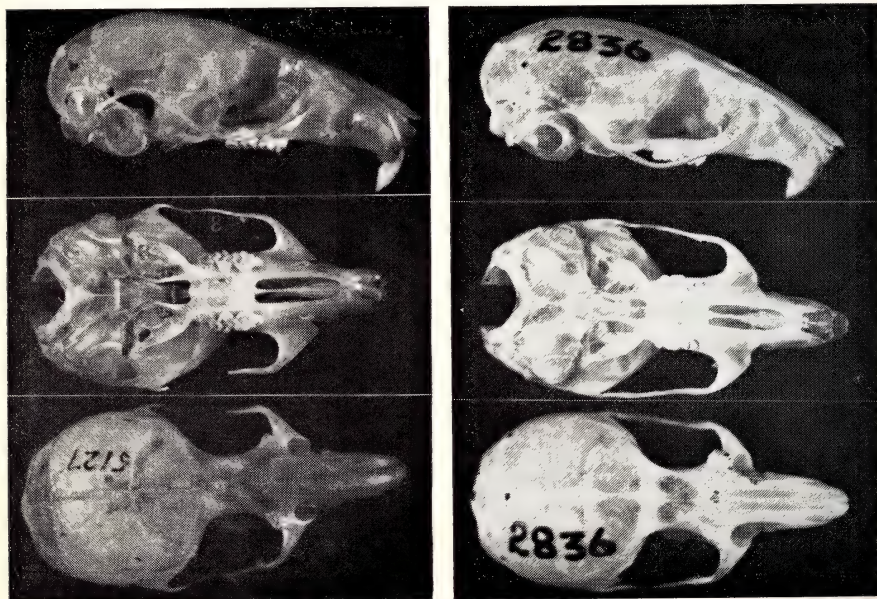


Figure 5. Skulls of *Pseudomys novaehollandiae*.

Left — Tyabb specimen.

Right — Port Stephens specimen.

photos: J. Cooper, Fisheries and Wildlife Department.

for local information; and Messrs. R. M. Warneke and J. K. Dempster, Fisheries and Wildlife Department, who provided much helpful criticism of the manuscript. Protected species were handled under the provisions of a permit issued by the Fisheries and Wildlife Department. Some of the equipment used was obtained with a grant from the M. A. Ingram Trust.

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A Biological Survey for Victoria

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(From an address delivered to the
F.N.C.V. on 13 July, 1970.)

Questions relating to conservation and national parks in Victoria in recent years have thrown great emphasis on the lack of real basic knowledge — and I stress the words "real basic" — that exists concerning the flora and fauna of this State. I do not wish to be misunderstood at this point, or to have my listeners think that I am critical of the activities of professional and amateur bodies interested today in the various phases of natural history or in conservation. Far from it — I have always had the greatest admiration for that large body of people, some individuals, some in societies, mostly amateurs who, over the past approximately 150 years have worked with a common end point — the accumulation of knowledge. I am ever reminded of this as, over the years, I have studied the dossiers of your Natural History Medallion awards.

A very early, and very well informed and respected member of your club — the late Sir Russell Grimwade — made a very profound statement in 1954, which to my way of thinking, has a definite bearing on the very subject we are discussing. Sir Russell, in his foreword to the Centenary History of the National Museum of Victoria, made the following statement —

"There are both duties and obligations upon those of a civilised people who, for their own or their country's advantage, enter a strange or almost empty land. The first duties consist of establishing what is known in modern military parlance as a bridgehead, a landing where their occupation is secure and where sorties can be made inland to survey and explore new territory.

The making of the bridgehead of British people on the coast of Australia towards the end of the 18th. century is now a well known matter of history. The difficulties of the first settlement

in an empty and comparatively harsh land were tremendous and of such magnitude that it was doubtful at times whether the planned occupation could be carried on. Carefree Australians today are apt to forget that at the time of first entry their land produced no orthodox food and its soils had never been cultivated, and that the abundance of foods produced within its boundaries today all have their origin overseas.

The germ of all edible plants and animals was imported from foreign lands, mostly those of the northern hemisphere. The provision of food, storage of water, and the development of means of communication constituted the first duties of the pioneers. When these very first needs were fulfilled, even in rudimentary manner, the obligation to posterity became revealed.

The thoughtful man in a new country like this then becomes aware of his obligations to his successors and realises that his coming to a new land may cause permanent changes in his environment. In no other country has the natural equilibrium achieved by countless centuries of isolation been so violently upset as in Australia. Within half a century of entry, this land was carrying millions of hoofed animals where not a single specimen had existed before. New trees, new crops and new insects were rapidly introduced—all prospered with a fecundity that has brought the country fame and fortune in a very short time. No country has been so violently disturbed in its age-old rest, and consequently in no country has the balanced environment of nature been so violently subjected to change. In no country, therefore, does the responsibility of preserving a knowledge of the past rest quite so heavily on its people."

These were truly prophetic words written by Sir Russell, which appear to have been forgotten since they were penned in 1954—at least I have never seen them quoted among the mass of material that has been printed or spoken during the conservation discussions of the past few years.

A second equally profound, but much older statement, carrying just as much wisdom, came from the writing of John Gould, that father of

Zoology and Zoological illustration in this country. This statement of his appears to have been equally forgotten.

Over 100 years ago, when Gould was writing his *Introduction to the Mammals of Australia*, he was mostly concerned with telling his readers about the discovery of the different kinds of mammals which occurred in the then newly occupied island continent (and incidentally in the discovery of which he had played such a conspicuous part). But even in these early days he found it necessary to speak of the problem which would be faced by the Australian naturalist in days ahead, and so he wrote—

"... Australia — a part of the world's surface still in maiden-dress, but the charms of which will ere long be ruffled and their true character no longer seen! These charms will not long survive the intrusion of the stockholder, the farmer, and the miner, each vying with the other to obliterate that which is so pleasing to every naturalist; and fortunate do I consider the circumstances which induced me to visit the country while so much of it remained in its primitive state."

What does all this mean? It means surely that in this country, now only just two hundred years of age as far as modern history is concerned, there existed a unique fauna and flora which we, as a civilised race, have changed considerably, or perhaps more accurately, have accelerated the change that was taking place. What is more important, I feel, is how much have we changed it, and in what direction are we changing it?

Some people find it very easy to answer these questions, relying to a certain extent on hearsay, or on their own observations over a period of years, sometimes short and sometimes long or even both. This of course is not the true overall picture, and it is absolutely certain that

no person living knows the exact picture. This should not unduly dismay or deter us, although I realise that it will probably upset some people who, with best of intentions, use their own limited observation as a basis for overall deductions. This can be dangerous of course, but in its favour is the fact that these people are thinking and comparing their own experience in two points of time—the present and as far back as they can genuinely remember. This is not the true picture that all of us are requiring. What we want to know, and I am afraid they will never be known, are two fundamental matters—firstly, to what extent has the fauna and flora of Australia changed since 1788, and secondly, at what rate is our position deteriorating or improving at the present time? It is true that quite intelligent guesses can be made at both of these questions, but are intelligent guesses enough? I maintain, that while they may indicate trends in certain directions, they do not produce answers in this scientific age that requires overall answers that cannot be questioned in any manner.

I would commend to you at this stage the very recently published book by Oxford University Press entitled "A Guide to the Mammals of Australia" by Dr. W. D. L. Ride, the Director of the Western Australian Museum. This very thoughtful work discusses not only the overall position of our fauna, but also the accurate history, as far as is known, of every individual species.

How can we establish the bank of information that we consider necessary for such purposes? I am afraid that, while the past 182 years have been ticking over, we have been losing valuable opportunities to provide the basis for making present-day comparisons. Let me point out

strongly at this juncture that I am not attempting to hold a post mortem on the present situation, with the intention of laying blame on someone or some particular policy. This to my way of thinking is childish in the extreme, and nothing is more likely to discourage serious consideration of a problem than this attitude, if it is slavishly left at that. True it is invaluable in providing some information, but such information must be used in a constructive form to provide a basis for future work.

If we look back a little into the past, and let us go right to the start of settlement in Victoria, we find that a commendable start was made in studying the natural history of this colony very early in its infancy, e.g., an Institute for the Advancement of Science held its first meeting in June 1854; the Philosophical Society of Victoria held its first meeting in August 1854; the Philosophical Institute of Victoria held its first meeting in July 1855; with the Royal Society of Victoria being given permission to use this title "Royal" in November 1859.

All of these scientific bodies were eminently constituted for first class scientific natural history work—such well known names as Baron von Mueller, Captain Andrew Clarke, Dr. Godfrey Howitt, Alfred Selwyn, Brough Smyth, and Professor Sir Frederick McCoy to mention just a few being prominent in the early work carried out by these institutions. Likewise, the Philosophical Society of Victoria was instrumental in establishing a Museum of Natural History, the forerunner of the now eminent National Museum of Victoria.

These bodies without exception, undertook field work in Victoria from their inception, and as settlement moved out from Port Phillip

so did the range of investigation move out. In many cases the exact opposite resulted — the expeditions of competent naturalists into, until then, unknown parts of Victoria providing the opportunity for settlement to be effective later. A great deal of information was published by the responsible Society at that time and this, combined with field notebooks that still exist in some cases, provide what we know today of the natural history of that period.

As an example of what was happening even at that time, it is worth considering for a short time the results of Blandowski's expedition to the River Murray in 1856 to 1857. William Blandowski, as some of you may know, was a Polish emigrant to this country who in April 1854 was appointed the first Government Zoologist to the Natural History Museum. He was also a member of several of the previously mentioned societies. In 1856, he was commissioned by the Government of the time to proceed northwards to the Murray River and collect specimens for the museum. Leaving Melbourne early in December 1856, he and his party travelled north to the river, collecting as they went. Because of several difficulties, which need not be discussed here, the actual number of species of mammals and birds collected was not large, although some 16,000 specimens of all kinds were deposited in the museum. What is most important, however, and very pertinent to this talk, is the fact that on this expedition alone he collected at least 7 native mammals, *none of which have ever been seen since*. These ranged from native cats, to Phascogales, to Bandicoots to marsupial Mice.

Now what is the significance of this? Surely, that even at that short time after man's entry to this country

our fauna was disappearing. I think it is well to remember this, as there are thoughts among some interested persons that this process is a very recent one — it is not, it has been going on for centuries, and while we may not be able to stop it completely, we should endeavour to slow the process to the lowest possible figure.

The inauguration of your own Field Naturalists Club in 1880 brought a fresh interest to natural history, with not only many of the scientific members of the earlier societies joining the club, but with a large number of devoted amateurs, who gave of their time and talents in unravelling some of the mysteries of nature in the new State of Victoria. The results of this work were published in the *Victorian Naturalist*, and many of the collections made were deposited in such institutions as the National Museum and the National Herbarium — these still form the backbone of a large part of our knowledge of that period. What a wonderful record of information is stored up in the pages of the *Naturalist* over the years.

At the same time or just before the earlier group of natural history societies were forming themselves in Melbourne, the government of the day established the Geological Survey of Victoria, with Alfred R. C. Selwyn being appointed in 1852 Director of this Survey. My reason for mentioning this very important fact in time is that while such a Geological Survey was established then and has functioned in a particularly valuable manner since that time, with only two separate and distinct breaks, to the present day, no serious attempt appears to have been made to establish a sister organisation, just as important as its opposite number, a Biological Survey of Victoria. The Geological

Survey of Victoria over its long period of service in this State, as well as proving most useful to miners and prospectors at the time of its inception, is now able, with its wealth of accumulated knowledge, to provide invaluable assistance to Governments and Industry alike, on matters of economy and policy.

Returning to the subject of a Biological Survey, what exactly do we mean when we use that term? Putting it as briefly as possible, it means a comprehensive study of the fauna and flora of a particular country in all its various ramifications, e.g., taxonomy, distribution, population, ecology, effect of introduced animals and plants and any other factors which have a bearing on the subject of fauna and flora. It automatically envisages four separate and distinct functions —

- (a) The building up and maintenance of fully documented collections of fauna and flora;
- (b) The conducting of research work, both in the laboratory and the field, on the collections so obtained, with additional field work to produce more collections and more research. (Of course this is becoming more difficult and more important in Victoria).
- (c) The repeating at regular intervals, and *this is most important*, of detailed surveys on a similar framework of research to determine change trends.
- (d) The interpretation of the results obtained from the above functions.

Because of the very nature of the work envisaged, it naturally embodies a large central organisation that can house both scientists, collectors and collections. But more of this later.

It is well to consider at this stage something of what has been done in the past, and the value of this information in formulating policy for a Biological Survey of Victoria. Let me make it perfectly clear at this point that this proposal I am putting forward is not an original idea of my own, or for that matter is it reasonably new. I understand that it has been discussed by this very club many years ago, the late Dr. C. S. Sutton, a botanist, being particularly interested in it. But like other ideas which require large sums of money, detailed organisation and certainly great capital expenditure, it becomes a Government venture which needs a very receptive and interested Government to get it off the ground.

If we go back well into the past and exclude the Geological Survey, we find that before the year 1860, there were two major institutions that were accumulating collections by conducting field survey work either by themselves or by interested naturalists, and conducting research on these collections and publishing the results. These were, of course, the National Museum which commenced operations in 1854; and the National Herbarium officially established in 1857, although there were abundant collections made prior to that date. Both of these institutions now house very valuable and extensive collections, many of which could never be replaced. These collections must form the basis for any future work on a Biological survey of Victoria or for that matter, a Biological Survey of Australia. These collections, of course, have their limitations, particularly as regards accurate localities, e.g. van Diemen's Land, terra Australis.

Referring to a proposed Biological Survey of Australia, this matter has been under consideration on a Com-

monwealth level for at least ten years, and detailed proposals have been submitted to the Commonwealth Government by a special committee of the Australian Academy of Science to set up, in Canberra, a "Museum of Australian Biology" which would have two main functions, (a) to carry out a biological survey of Australia and its territories, and (b) compile a comprehensive volume on the "Flora of Australia." This latter, as you all know, has been urgently required in this country for many years, there having been nothing published on such a comprehensive scale since Bentham and Mueller's *Flora Australiensis*, published between 1863 and 1878, and although this has been recently reprinted, it contains nothing new as it is a facsimile edition.

It is pertinent to comment here that with both of these projects, the new museum will have to fall back very heavily on information that has been gained by the States over the past now nearly two centuries—some information that is vague and of doubtful use, the remainder being of great importance.

Any attempt to carry out a detailed biological survey of Australia now will of course be important in determining the present state of the huge complex of animals and plants in this country—the great pity being that a similar project had not been initiated a century ago, when useful comparisons could have been made with the present position, information that would have been invaluable in discussion on conservation. As far as the preparation of a *Flora of Australia* is concerned, such work must of necessity be based almost entirely on information available from State Herbaria or from State Floras that have been published from time to time. In this regard,

Victoria is in a very vital position, its Herbarium containing not only the greatest number of specimens of any herbarium in Australia—between one and a half and two million, certainly not all Australian—but also the majority of von Mueller's type specimens—some 2,000 all told; while J. H. Willis' *Handbook of the Plants of Victoria* is the most comprehensive State Flora that has yet been published, and must be vital to the Biological Survey of the future.

The remaining sources of information are quite varied and numerous, and consist largely of information stored away in a number of Government or University Departments, and in a small number of cases in the records of amateur naturalists. This has been, of course, the natural development over the years in the absence of any unified control of such scientific work. To name some of the projects that have been carried out apart from the National Herbarium and the National Museum we have the mammal and other projects of survey and ecology by the Fisheries and Wild Life Department; the entomological and plant pathological work of the Department of Agriculture; the entomological research of the Universities of Melbourne and Monash; the mammal work at Monash University; the detailed researches of C.S.I.R.O. and the Commonwealth Serum Laboratories on insects, spiders, mites and reptiles; the entomological and plant disease work of the Forests Commission; not forgetting of course the valuable work conducted by such naturalist bodies as the R.A.O.U., the B.O.C., and the F.N. Clubs, and certainly not forgetting the individual amateur work of such present day authorities as Jean Galbraith and Cliff Beauglehole. The amateurs of the future will certainly have a

greater part to play than in the past. Again, I emphasise, there is no criticism on my part of any of this work—all concerned have contributed greatly under far from ideal conditions.

Now where does all of this bring us? If it were possible in Victoria, at some top administrative level, to bring together under one unified control all of the results obtained over the years and to direct future activities so that there was no overlapping, or at the most, a minimum of overlapping, then a nucleus for a Biological Survey for Victoria would have been set up.

There are world recognised techniques on how such a survey could be organised in a State such as Victoria, and it is not my intention to discuss these in great detail; but it is perhaps pertinent at this point in this address to say something of the work that has already been carried out, and is planned for the future by the Plant Survey Council of Victoria, as this, I feel can readily set a pattern for the future. This body was set up in 1966 under the sponsorship of the Botanic Gardens Branch Research Trust, one of the bodies set up by the late Maud Gibson, and the Botany Department of Monash University. Its aim was to provide factual information about the detailed distribution of plants, both past and present, information which is basic to any future scientific botanical study in the State. The extent and the rate of change in the distribution of plant species can only be met by a comprehensive mapping scheme, such a scheme contributing greatly to bridging the gap between increasing agricultural and industrial requirements and inadequate conservation.

The method being adopted, which corresponds closely to that originat-

ing in the United Kingdom, is to use modern mechanical data-processing methods in preparing a comprehensive series of maps (1 for each species) based on distribution within a series of squares on a standard map. As an example of what can be done, we have here a copy of a Scandinavian Plant Survey of similar style, in which the distribution of all species present is shown in map form. In Victoria, the presence of each species will be plotted in each 10 minute "square" of latitude and longitude, using the Department of National Mapping grid superimposed on their Geographic Series Maps of 1 : 500,000 scale. The magnitude of such a task will be seen when it is noted that there are more than 1,000 such "squares" in Victoria, each square approximately 11 miles from north to south by 9 miles from east to west. A copy of this reference map will be used as end papers in Vol. II of J. H. Willis' Handbook to the Plants of Victoria which we hope will be published within twelve months.

The ultimate aim of such a project as this is to map the total distribution of every species of plant throughout Victoria. To do this, mapping must be based upon a sufficient number of localities evenly distributed within the area in question, notwithstanding whether the species is rare or common. The biggest limiting factor of course will be the scarcity of trained observers and collectors. It will be essential to the success of such a survey to have not only devoted observers, but observers who have an accurate knowledge of the identification of species or plants and a detailed knowledge of the area in question, who are prepared for many years to devote the whole of their spare time at all periods of the year to a con-

centrated effort within perhaps one of these "squares". While such areas may appear small on a map of Victoria, a detailed study of an area 11 miles by 9 miles over every period of the year, is a major project. At this early stage of the survey, it will be advisable to concentrate only on the presence or absence of any species in an area — at a later stage will come the determination of relative abundance, plant ecology, change in habits, etc. It is much wiser to get the scheme off the ground in a simple but effective form rather than bog it down with masses of details which observers may not be able to fulfil.

How will such a project be organised? It will depend, I feel, on three essentials —

- (a) The availability of sufficient trained observers who are prepared to undertake this task. Where will these people come from? Obviously the various Field Naturalists' Clubs throughout the State will play a major part in this task. It is worth recording at this part of the address that one of your active botanists, Cliff Beaglehole, has for the past two years, been undertaking such work for the Plant Survey Council in the Grampians — an area chosen because of its importance botanically in the State, and also because of Cliff Beaglehole's intimate knowledge of the area. The result of this survey has been spectacular — whereas in 1965/66 some 825 species had been recorded from this area, this figure has now been increased to over 1,000 by such collectings. Later, he has obtained similar information in far-east Gipps-

land. In addition to F.N.C.V. members, it is anticipated that reliable accurate results will also be obtained from Forest Commission Officers, Land Department Inspectors, Agricultural Department officers living in a particular area, High School teachers with a knowledge of biology. There is a wide field of untapped observers who, with a little training, could commence this work.

- (b) The provision of accurate information of what species are likely to be present in any given locality. This is fundamental to such a project. Fortunately, a great deal of this work has already been carried out by the National Herbarium and the Botany and Computer Departments of Monash University. All available records have been obtained and examined, both specimens and literature, and relevant information transferred to computer sheets so that in quite a small form, much knowledge of every species of Victorian plant is stored away. I have here the completed picture for all plant species in Victoria giving synonyms, authorities and distribution within the State as per the grid system. While this is a useful document on its own, its main value lies in the ability to obtain from this, computer printing of all the species recorded from any of the major squares. Once this is printed, it will form the basis for work within each of the squares.
- (c) Where any uncertainty exists in the mind of the observer

during the survey, he must collect actual specimens of the suspect plant and forward them to the National Herbarium for identification. While this sounds easy in theory, it is not so easy in practice, as it throws an additional burden on the staff of the National Herbarium who are already numerically short-staffed. While this may appear to be only an administrative matter, it is a real problem, as taxonomic botanists are difficult people to obtain these days.

The obvious question is what will be the use of doing this survey. I feel it will enable two things to be done.

Firstly, if carried out over a sufficiently large number of years, it will provide vital information that can be used in conservation studies and determining policy; and secondly, will provide a scientific basis for further studies in distribution, and ecology. The printing of such material for each square, combined with similarly sized transparent sheets showing rainfall, elevations and soil types, opens up endless work for the future.

While this latter part of the address has concentrated largely on botany, because this is the section of natural history that has been studied in detail up to date, exactly the same can be applied to mammals, birds, reptiles, insects, spiders and the host of other forms that make up the entire biological picture.

Perhaps some of you will say that this is only a dream—it could be a nightmare for the person organising it—that could not be effected prac-

tically. I personally do not think that this is correct. Provided there are enough persons with vision who can influence authoritative persons, the scheme could get off the ground. It would be a major project—one of the greatest ever undertaken in natural history in this State, but what conclusions could be forthcoming from such a project! For example, in the study of mammals, would we have had to wait so long for the rediscovery of Leadbeater's Possum, or the discovery of a live *Burramys* near Mt. Hotham, previously known only in fossil remains.

How could such a Biological Survey be conducted? It would first require the establishment of a central biological institute, directed by an experienced versatile scientist who, with sufficient expert and technical staff, would examine, sieve out, and collate, all relevant past information available from literature or from specimens and records still to be found in various Government Departments; and secondly this Institute should have sufficient trained outdoor staff to undertake survey work in natural history generally of the same standard and calibre as has been described in the Plant Survey work being contemplated now. The present is not too late for this—but time is running out.

In conclusion, I would like to refer to the late Sir Herbert Olney, whom some of you may remember, and who had a very happy way of approaching such a position. When anything major was being discussed in committee by any of the major boards of which he was Chairman, and when all the drawbacks and difficulties were being presented, he would quietly take from his pocket some small badges, and give them to the dissentients. On this appeared four words only—*It Can Be Done!*

Victorian Non-Marine Molluscs — No. 2

by

BRIAN J. SMITH*

Victoria has a number of introduced non-marine molluscs belonging to several families. All of these are fairly common, successful animals with a very wide distribution. Many occur in large numbers and can even reach plague or pest proportions — unlike the native species which are usually localized and living in perfect balance with their environment.

Perhaps the best known group of introduced snails belong to the family Helicidae of which there are no native species in Australia. Victoria probably has 7 species of this family and these will be described in this and next month's article.

Helix aspersa Müller — The Common Garden Snail.

This is the snail with the large brown, globular shell, found in great numbers in most gardens. The patterning on the shell is very variable, ranging from a dark brown shell with wide, black, zigzag bands, giving the shell a very dark colour, to a pale, straw-coloured shell with a few faint, brown lines. Large specimens reach over 30mm. in diameter. They are frequently found crawling on paths after dark or in wet weather. In dry weather they can be found sealed to smooth surfaces in damp, dark places, aestivating. When crawling, they extend a long way out of the shells, the body being a dark, muddy green, to grey. They should be found anywhere in the state where man has extensive settlement, though they will tend to be confined to the damper garden situations.

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Genus *Cochlicella*

Two more helioid species, commonly found in certain parts, belong to the genus *Cochlicella*, The Pointed Snails. The smallest and most common of these is *Cochlicella ventrosa* (Ferussac). This has a small, conical shell about 8-10 mm. high. The shell is often very thin and fragile, except in calcium-rich areas, and usually has a series of dark brown bands on a light shell. These bands may, in some cases, be so wide as to give the appearance of a uniform dark shell. This species is common in coastal regions and in sandy areas in the Southern part of the state; however it may prove to have an even wider distribution.

The other species of this genus to be recorded from Victoria is *Cochlicella acuta* Müller. This can be distinguished from *C. ventrosa* by its larger size and different shell pattern. This species has a very elongated shell, averaging between 15-26 mm. It is usually a light fawn colour with small brown flecks and a single dark brown band at the base of each whorl. This seems to be more commonly found in the Northern part of the state in the drier, sandy areas, but, like the other species, may have a wider distribution.



Fig. B — *Cochlicella ventrosa*

Fig. A — *Helix aspersa*

Fig. C — *Cochlicella acuta*

(Drawings by Miss Rhyllis Plant).

Award of the Australian Natural History Medallion

by

A. J. SWABY AND J. H. WILLIS

Since its inception in 1939, the Australian Natural History Medallion has been awarded to only four women — all members of the Field Naturalists Club of Victoria. Latest in this distinguished company, which includes Edith Coleman decd. (1949), Thistle Stead (1963) and Winifred Waddell (1964), is Miss Jean Galbraith of Tyers (via Traralgon), Vic. Her selection by the Award Committee, from among 16 nominees for 1970, was greeted by enthusiastic approbation and genuine delight throughout our Club.

It is almost 47 years since Jean linked up as a country member of the F.N.C.V., on 10 December, 1923, and in April 1959 she was unanimously elected to honorary membership. Her first note to the *Victorian Naturalist*, on "Magpies as Peacemakers", was published in December 1925 (Vol. 42 page 210). Since that date she has embellished the journal with 81 papers and natural history notes of great variety, but chiefly concerning plant and bird life. Outstanding was a series of illustrated and informative articles on "Australian Wattles" (most of them indigenous to Victoria) that appeared as 39 separate contributions between May 1959 and March 1964. There are few indeed who have been so active in the literary and practical life of this Club for five decades. Among her special friends during earlier days were such stalwarts as the late Edith Coleman, T. S. Hart, H. B. Williamson, E. E. Pescott, Mr. and Mrs. C. L. Barrett. At Club



Photo by courtesy of Mrs. S. Dearnley,
Collins Publishers.

shows in the 20's and 30's she was a familiar figure at the systematic tables of wildflowers, applying her knowledge cheerfully. With the more recent formation of the Latrobe Valley, Sale and Bairnsdale Naturalists' Clubs, Jean's energies as lecturer and excursion leader have found a convenient outlet nearer home in Gippsland.

In February 1926, the *Garden Lover* initiated a long series of monthly articles on Australian plants, 'Day to day in the Garden' under the authorship of "Correa"; while in 1954 *Your Garden* began a regular feature on 'Trees', followed for a year or two by a garden diary. Correspondence indicated that people throughout Australia read both publications; but it was equally evident that many readers looked forward principally to the contributions of "Correa". Her notes, full of sympathetic understanding and infec-

tious delight in the ways of nature, Society for Growing Australian revealed a gentle country family, their establishment of a wild garden, the co-operation of friends and neighbours, their devout but thoroughly practical Christianity, and her own intense interest in Australian plants. It is not difficult to guess the identity of "Correa"! Many of these early experiences and observations were gathered together and published in book form as "*A Garden in a Valley*" (Dec. 1939) — it has been out of print for a generation, but one continues to hope for another edition of this altogether enchanting record.

When A. J. Ewart's *Flora of Victoria* (1931) became increasingly rare and expensive, and E. E. Pescott's earlier *Native Flowers of Victoria* (1914) was quite unobtainable, Miss Winifred Waddell conceived the idea of a new wildflower guide for the State: something of reasonably low price which, while by no means comprehensive, would illustrate and describe in simple non-technical language representative species of flowers from every family and district. Who better to undertake such a task than Jean Galbraith? Thus, *Wildflowers of Victoria*, with 175 photographic plates, came off the press in 1950, satisfying a very real need; it is now in the third edition, nomenclature brought up to date. Miss Galbraith has spent the last few years writing a much more comprehensive book on plants found between the Dividing Range and coast of south-eastern Australia (Queensland to South Australia). This is now in press and will be published in 1971 by Collins of London.

The first wildflower sanctuary ever established by the Native Plants Preservation Society of Victoria was at Tyers, donated by Jean Galbraith and dating from 1936. At the formation in 1957 of the now very large

Society for Growing Australian Plants, Jean's wide influence in this field was recognized by her election as a foundation life member. Her gift for imparting knowledge in crisp descriptive phrases is apparent through innumerable articles for children in the N.S.W. *School Magazine*. She has also written several charming booklets for 7-9 year olds on such subjects as "Fruits" and "From Flower to Fruit" (the pollination and fertilization processes), published by Longmans, in addition to the popular "Grandma Honeypot" and "The Wonderful Butterfly" published by Angus & Robertson. In recent years her presence as a very acceptable lecturer on the C.A.E. summer schools at Mt. Beauty (near Bogong) has become an annual event.

Jean has travelled widely in all Australian States, observing, appreciating and collecting assiduously. The National Herbarium of Victoria is fortunate in having a large share of her dried botanical specimens from these expeditions, as well as many local lists of plants compiled for various districts she has visited in her home State. Her discoveries include several new species, e.g., a rare parrot-pea (*Dillwynia*) at Mt. Beauty and a willow-herb (*Epilobium*) on the Dargo High Plains, and she has been able to extend the known range of other less common plants. To those of us who have experienced the hospitality of her happy home, the warm friendliness yet innate modesty of her personality, and her big-hearted capacity to see only the better side of everyone else's nature, this present honour seems long overdue. For quality of work and impact on the public, no one could be a more worthy recipient of the Australian Natural History Medallion, 1970.

Mortuary and other Monuments to Aborigines

by

ALDO MASSOLA*

The psychology of armed conquest dictates that the winner takes all. The loser becomes an object of scorn and it appears to be perfectly natural that he should forgo not only his worldly possessions, but also his social standing, and often, especially if of a different race, even his rights as a human being. His women-folk, too, are at the mercy of the conqueror, and at least a proportion of them willingly and by choice leave their discredited men and elect to become the "mates" of the dispossessors of their own people.

This also happened in Australia. The first colonists formed a poor opinion of the "sneaking, murdering, black cannibals", as they were described by a shepherd (*Letters from Victorian Pioneers*); yet many of the shepherds and not a few of their "gentlemanly" masters kept the "astonishingly beautiful" native women at their stations. Witness the high percentage of half-castes in the present day Aboriginal population; who are certainly not descended from Aboriginal men - European women alliances.

The Aborigines then, having been subjected to the usual loser's treatment, and having been regarded by their conquerors as of no account, it is hardly surprising to notice that in Victoria very few monuments were erected to their memory.

However, there are cases where, for one reason or another, the passing of individual Aborigines was commemorated by the erection of a suitable grave stone; and since not many people are aware of the existence of these monuments I have listed them here, so as to bring them to notice; at any rate, they are all

I have been able to find during many years of searching for Aboriginal antiquities in this State.

With reference to the grave stones, it will be understood that only those erected over the remains of pure blood Aborigines by persons other than members of their own family will be reviewed here. Examples marking the last resting place of recent Aborigines erected by their own families are not included, since they fall into a class apart and cannot be regarded as public memorials.

BALLARAT.

Over a grave in the New Cemetery at Ballarat there is an obelisk bearing an inscription denoting it to have been erected over "the Resting Place of Frank, last of the Ballarat Tribe of Aborigines".

Frank belonged to the Lake Burrumbeet group of the Wothowurong tribe and as a young man became attached to William Wilson, the owner of Ercildoune Station, which was within the territory of the Lake Burrumbeet group, the Burrumbeet Buluk. Frank became a Wesleyan, and took Wilson as his surname. Towards the end of 1896, when about 75 years of age, he took gravely ill. Mr. Wilson notified the Ballarat Police of his condition and he was taken to the Ballarat Hospital, where he subsequently died. Frank was buried on 26th September, 1896, was buried on 26 September, 1896, his grave being a Special Grant, vested in the Australian Historical Records Society, and the obelisk was erected upon it the following year with funds raised by public subscription.

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There is a story of Frank having a dog, which for a time kept the Police at bay when they came to remove him from Ercildoune, and that it stayed outside the hospital while Frank was there, and followed him to the cemetery, where it was later seen digging a hole on the grave in order to reach its master.

CAMPERDOWN.

Camperdown has the distinction of having Victoria's most beautiful and imposing monument to the Aborigines. It is situated in a dominating position in the centre of the cemetery, and inscribed "In Memory of the Aborigines of this District" as well as "Here lies the body of the chief Wombeetch Puyuun, the last of the local tribes". The face of the obelisk is also decorated with engravings representing a boomerang, a fighting club, a throwing stick, and with the dates, 1840 and 1883. The first is locally believed to have been either the date of Wombeetch's birth or of the beginning of the end of the tribes; the second was the date of his death.

The obelisk was erected by public subscription through the untiring efforts of James Dawson, author of a well known book on the Aborigines of the Western District, and his daughter, to whom we are indebted for lists of the local Aboriginal language. James Dawson was a real friend of the Aborigines, and saw with sorrow their passing. Mrs. Dawson, who was a daughter of Mungo Park, the famous African explorer, also always went out of her way to help the unfortunate remnants of the tribes.

Wombeetch Puyuun, which in English means "The Stench of a Rotting Kangaroo" was locally known as Camperdown George. His uncomplimentary native name was due to the Aboriginal habit of naming



Plate 1 The monument to Wombeetch Puyuun, at Camperdown.

children after some happenings or peculiarities of terrain or after the place where they were born. Though he was the last of the Jarcoorts it is unlikely that he ever became a "chief", since by the time that he was old enough to be a headsman there would hardly have been any of his people alive. An early photograph of Camperdown George was published by me in *The Victorian Naturalist*, 83 p. 129, June 1966.

CORANDERRK.

Coranderrk, near Healesville, was an Aboriginal Reserve, and as such had its own cemetery, picturesquely situated on a rise dominating the site of the Reserve. At least 300 Aborigines were buried there, but the only monument marking the last resting place of any of them is over the remains of Berak, the last of the "Yarra" tribe.

In a former paper, (*The Victorian Naturalist*, 76 p. 252, February, 1960) I have given an outline of Berak's life and the history of the monument now over his grave. Since then, however, I have learnt three interesting facts:

1. That the name Berak means "Hot Wind" which must have been blowing when he was born.

2. That his father, Bebe-jern, died of old age at the foot of Yerringberg Hill, close to the Yarra, where he was buried. His body was bent double, his knees touching his chin, and he was enveloped in a kangaroo skin rug and tightly corded; he was not buried in the grounds of the Mental Hospital at Kew as I formerly believed and wrote.

3. That despite the unanimous recommendation by the Board for the Protection of Aborigines, the Honorable the Chief Secretary could not see his way clear "on the grounds of economy" to contribute £20 to the public subscription for erecting the monument to the memory of the last of Melbourne's Aborigines!

DONALD.

In one of Alec Russell's paddocks, south-east of the Little Lake, there is what tradition claims to be an Aboriginal Stockmen's Cemetery. The "cemetery" is within a grassed paddock and is unfenced. The graves are suggested by a number of low mounds, which, although of the right shape, would pass completely unnoticed except for a cement column or post, about four feet high and a foot in diameter, which was "stood up" many years ago; and since it serves no functional purpose, it is possible that it is a grave marker. Tradition is silent as to the identity of the Aboriginal stockmen, but it is recorded that a number of Aborigines

were in constant employment on the early local stations, and that several of them distinguished themselves in horse racing and other local sporting events.

EBENEZER.

This Mission Station, which was established near Arkona by the Moravian Board of Missions in January, 1859, looked after the well-being of the Wimmera and Mallee tribes until October, 1904, when it was closed, because there were not enough Aborigines to warrant its continuance. About 150 Aborigines and five Lutheran Missionaries were buried in the little cemetery at the back of the Mission Church; and both it and the ground the Church stands upon have now been declared Permanent Reserves.

Ten grave-stones were erected in this cemetery, five for the missionaries and five for Aborigines, of whom three were born at the Mission; and since these memorials were all put up by surviving members of their families they fall outside the scope of this list. The cemetery is only listed here for the sake of completeness.

EDENHOPE.

A monument of a different kind was erected to the Aborigines on the shores of Lake Wallace at Edenhope. This is an obelisk to mark the fact that the Aboriginal Cricket Team which visited England in 1868, the first of any race to visit the Mother Country, trained and set off from there. As is well known, the team's Manager was W. R. Hayman, and the Captain C. Lawrence. The Aborigines composing the team were: Mullagh, Dick-a-Dick, Towpenny, Red Cap, Mosquito, King Cole, Peter, Cuzens, Tiger, Jim Crow, Bullocky, Dumas, and Sundown. In

England they played 47 matches, winning 14, losing 14, the remaining 19 being drawn.

GEE-LONG.

There are two cemeteries at Geelong, and there is a memorial to Aborigines in both of them. In the Eastern Cemetery an upright cross marks the grave of Billy Leigh, who was 'King' of the Yawangi, as the tribal group who owned the You Yangs was called. Billy and his group were 'adopted' by Frederick Armytage and his wife, the then owners of Woolloomanata Station. Billy was baptised and confirmed in the Church of England at Lara, and when he died in August 1912, the last of his group, the Armytages erected the cross over his grave, at the base of which there is a tablet stating that



Plate 2 Grave of Billy Leigh — Geelong Eastern Cemetery.

Billy had been a friend of the family for over 60 years. A second tablet affixed to the grave reads:

Coo-ee, coo-ee, Billy Leigh.
Station mates in sympathy
grieved in spirit, one and all
joined together in the call
of farewell we send to thee.
Coo-ee, coo-ee, Billy Leigh.

The last seven Aborigines of the once powerful Geelong or Wothowurong tribe, sleep in three adjoining graves which they share in common in the Western Cemetery. That they are buried there is due to the humane sentiments of a former Mayor of Geelong, Robert de Bruce Johnstone, who saw to their comfort when living and provided a place for them to rest undisturbed when dead. The Aborigines buried there are:

Dick, who died on	24.2.1862
Ellen,	25.11.1864
Jemmy Nelson,	25.4.1866
Timboo	25.12.1866
Harry Gore	25.3.1868
King Jerry,	
(Dan Dan Nook)	23.8.1870
King Billy Gore	11.11.1885

King Billy Gore, the last Barrabool man, was born on the site of the present parking station in Jacob's Street, Geelong, and was given the name of "Worm Bunyip" by his father, Wa-wa, because that day he saw a bunyip at Worm (Waurm Ponds) where he had gone hunting. This name was engraved on the brass "king plate" which Billy Gore wore to the last of his days.

Photographs of King Billy Gore and most other Aborigines named in this article are a feature of my forthcoming book *Journey to Aboriginal Victoria*.

HARROW.

At Harrow Cricket Ground there is a monument commemorating Johnny Mullagh's victories. He deserved it:

his batting average for the English Tour was 23.65 runs, and he made 1,690 runs and took 245 wickets. However, when he returned from England he gradually lapsed into obscurity, and lived his last days in a humpy near a swamp at the back of W. B. Edgar's Pine Hill Estate, near Harrow. When he died his bat and knee pads were placed in the coffin and buried with him in the Harrow Cemetery. The headstone on his grave reads:

Here lies Johnny Mullagh, (Aboriginal) World Famed Cricketer. Born, 1843 died 14th. Aug. 1891.

LAKE CONDAH.

The little native cemetery attached to this former Church of England Mission Station was declared a Permanent Reserve in 1951. Aborigines belonging to the mission have been buried there since the year 1867; and it is still being used as a burying place by their modern descendants who live scattered about the district. However, there are only three grave stones in the cemetery, the inscription of one is illegible and the other two belong to Aborigines born at the mission. These stones having been erected by members of the family of the deceased will not be described; but it could be useful to know that they are there.

MELBOURNE.

In the Melbourne General Cemetery there is a grave stone of more than usual historical interest. The inscription upon it reads that it was "Erected by a few colonists to commemorate the noble act of the native chief Derrimut, who by timely information given October 1835 to the first colonists, Messrs. Fawcner, Lancey, Evans, Henry Batman and their dependants saved them from massacre planned by some of the up-country tribes of Aborigines.

Derrimut closed his mortal career in the Benevolent Asylum, 28 May, 1864, aged about 54 years".

Herein lies the story of a drama the details of which, left in manuscript by John Pascoe Fawcner, were published in the La Trobe Library Journal, Vol. I, No. 3, 1969. An interesting article on Derrimut and a photograph of the grave stone were published in *The Victorian Naturalist*, 79, February, 1963.

The name Derrimut was variously spelt by the old writers, and forms such as Derrimot, Derriemert, Derri-mart, Derrihmart, Derah Mat, and Derrahmert, are seen. The correct form should probably be Derrahmut, in which case the meaning of the name would be "To Pursue" or "To Hunt". Derrimut's "noble" act was, of course, the betrayal of his people.



Plate 3 Monument to Johnny Mullagh, at Harrow.

MILDURA.

Mary Woolong was the last pure blood Aboriginal of the Mildura District. She was the third wife of the Werlong, or Woolong, or Whorlong, of the Euston tribe, who was born about 1837, and taken to England, Ireland, and France by the late Mrs. McCallum of Youngera Station. During this trip he threw the boomerang before Queen Victoria, in 1859, to show her how it was done. He died about 1914.

I have not been able to find any particulars about Mary, other than that she was a kind person, full of womanly understanding and charity. She died on 11 November, 1942, and was buried at the Mildura Cemetery. Her neat grave features a headstone on which there is a rendering



Plate 4 Grave of King Charles Tattambo, at Murchison.

of a boomerang in high relief, inscribed with the words:

"Mary returns home".

Underneath it appears her profile shown as a black silhouette on the white stone; and below that again the words "Last of the Kulkine Tribe". Her name and the date of her death are shown at the foot of the grave. It is a simple, yet effective memorial.

MURCHISON.

In the Murchison Cemetery an unusual grave marks the last resting place of King Charles Tattambo. It is enclosed in an iron railing, the four sides of which are shaped like spoked wheels, and the four corner "posts" and two central uprights represent up-standing spears. On the top edge of both the front and the back "wheels" two shorter spears support respectively Tattambo's "king plate" and a brass boomerang.

The king plate, which must have been a proud possession, is inscribed with the words "Tattambo King Molka Station" and, in smaller characters, the bitter reminder:

"Belonging to Mr. Fryer".

The centre of the plate is occupied by a small rendition of an Aboriginal carrying a shield and with spear poised for throwing. The boomerang bears the simple inscription "Tattambo, died Sept. 1865".

This grave is also occupied by Tattambo's last wife, Queen Mary. She died suddenly, on 24 October, 1867, when returning from the cemetery where she had seen Captain John, Tattambo's son (but not her's) being buried in a grave next to his father's. The next day her husband's grave was opened and her coffin placed on top of his.

NAREEB-NAREEB.

In the graveyard at Nareeb-Nareeb Station there is a hand-hewn headstone incised with the name "Barring-

bittarney" and the date "1878". In his reminiscences, published under the title "Western Victoria in the Forties" Charles Gray, who was a former owner of the station, wrote that Timour (Barringbittarney) was the head of the tribe, and that when he died at an advanced age he was buried by his own people. Two sheets of bark were cut from a large gum tree, and his body was sandwiched between them and tied with kangaroo sinews, and then interred in the little grave yard. A photograph of the headstone which was later placed over the grave appears in *The Victorian Naturalist*, 85, November, 1968.

RAMAHYUCK.

This was a Moravian Mission Station established in June, 1863, near Lake Wellington, in Gippsland, and closed in March, 1908. The land belonging to it has been subdivided by the Soldier Settlement Commission, and all that remains to mark the site of the mission is the little cemetery, unfenced and grazed upon by cattle and only recognised as such by a number of little mounds and by three headstones, which, however, have been pushed over by the cattle. Two of these stones are white, and mark the resting place of early white settlers in the district. The third one is black, and though the inscription has worn off, I have been able to show in my "History of Ramahyuck", that this is the stone erected by the missionary over the grave of his first Aboriginal convert, Nathanael Pepper.

Nathanael, a native of Lake Hindmarsh, in the Mallee, was baptised at Ebenezer Mission Station, and later travelled to Ramahyuck to join Hagenauer, the missionary who had converted him. He became a preacher

on his own account, and was instrumental in baptizing a number of Aborigines. He died on 7 March, 1877.

SWAN HILL.

Aggie Edwards was the last pure blood Aborigine of the Swan Hill District. A gentle, frail but tall woman, she was born in the late 1880's at Moolpa Station, between Swan Hill and Balranald, N.S.W. Her father was King Wilson; he came from the Murrumbidgee and when he died was buried at Lake Toooin on Murray Downs Station. When quite young Aggie was married to Harry Edwards, a pure blooded Aborigine old enough to be her father, and they camped for a number of years on J. Nesbitt's Estate, about 12 miles downstream from Swan Hill but on the N.S.W. side of the Murray. Speewa Island was also a favourite camping place.

Harry died in 1912, and Aggie never remarried. She died in November, 1928 and was buried in the Swan Hill Cemetery. In 1930 the Swan Hill Branch of the A.N.A. "fixed up" her grave, and erected a headstone on which is written:

In Memory of Aggie Edwards, last Queen of Moolpa tribe of Aborigines, died Nov. 1928. Erected by Swan Hill Branch A.N.A.

* * * *

This completes the list of monuments erected in Victoria to the memory of the first Australians. It is short enough, which lends weight to the correctness of my thinking as set out in the introduction. One would think that the Government of Victoria would see fit to erect a monument in a prominent position as a memorial to the departed tribes. It would both grace the City and show that it has a conscience.

Field Naturalists Club of Victoria

General Meeting

14 September, 1970

The meeting was opened by Mr. T. Sault, the President, who extended a welcome to the 70 members and guests present.

Mr. Sault announced with regret the deaths of two longstanding members of the club. They were Miss M. Elder of Kallista, and Mr. N. Learmonth of Portland. Mr. J. Willis said that the deaths of these two members was a great loss to the Natural History field as both were active and well known. Miss Elder, a former Council member, was active in the Bird Observers Club and the Native Plants Preservation Society and had travelled widely in Australia and abroad. Mr. Noel Learmonth, who was 90 years of age, was a very hospitable person and had enjoyed a rich and rewarding life to the end. He was a founder of the Portland Field Naturalists Club and had also written a history of that district.

Miss Young informed the meeting of the death of another old member, Mrs. Fred Lewis.

A visitor to the meeting was Mr. A. Chisholm, a former Editor of the *Victorian Naturalist*, now residing in Sydney. Mr. Chisholm spoke of his long association with the club and wished it well for the future. Also present was Mr. I. Hammett who has been a member of the club for 40 years.

Correspondence tabled by the Secretary included a reply from the Fisheries and Wildlife Dept. regarding the action to be taken on conservation of penguins at Phillip Island, a letter from Mr. W. A. Borthwick, Minister of Lands, stating that the application for a lease in the Mt. Napier district had been rejected and the area was to be assessed with consideration being given to the establishment of a national park. Mr. D. Lee showed a slide of Mt. Napier which illustrated the mountain and surrounding countryside.

A letter of thanks was received from Mr. Pescott, expressing his pleasure for the dinner and presentation given him by club members on his retirement.

Letters were also received from the Post Office concerning increased postal charges for the magazine, the Tasmanian F.N.C. asking for advice on club study groups and publishing, and the Wychitella Forest Protection League with further information on the proposed national park for this area.

Mr. Bill Saxton, of "Binnalong", Tumbarumba, N.S.W., wrote regarding vandalism to aboriginal camp sites, rock paintings, etc., particularly in the Upper Murray area, after publicity is given to their discovery. He suggested we make an effort to have legislation enacted to protect such finds from commercial exploitation as is done in N.S.W.

The guest speaker for the evening was Mr. A. O. Lawrence, O.B.E., Chairman of the C.C.V. and recently retired Chairman of the Forests Commission, whose subject was "The Conservation Movement in Victoria". Mr. Lawrence outlined the growth of the conservation movement from the beginning of the century when forests were used wastefully because of the bountiful supply. Originating in Western Europe, conservation was defined as "the wise use of resources". In Australia, the beginning at federal level, was the conservation of water resources and later the conservation of soil. The development of new groups interested in all branches of natural history, led the movement into a wider field and such bodies as the National Parks Association were formed. Further moves were for the preservation of the environment as a whole, including pollution of all forms; soil, water, air, etc. To obtain the co-operation of all interested bodies, the C.C.V. was set up and it is now active with 55 member organisations covering all aspects of conservation in Victoria. The recently introduced Land Resources Bill has been studied by the Council and it is believed to contain significant improvements for the wise use of Crown Lands. Mr. Sault thanked Mr. Lawrence for his informative talk which was received with great interest by members.

Notice of Gratitude

The Halafoff Family wish to express their sincere gratitude to Dr. L. H. Smith for a sensitive and superbly written obituary of Late K. C. Halafoff.

Botany Group Meeting

10 September, 1970

Mr. Fell was the speaker at this meeting. His subject was "The Ecology of Western Australian Plants", ecology being the relationship of plants to their general environment and to each other. Maps of the floral areas of Western Australia were shown.

Mr. Fell said he was confining the talk to the south-west area, excluding the Mallee country. He found that plants usually followed the soil lines rather than the rainfall. One of the main points discussed was the size of trees and smaller plants. For instance, *Eucalyptus tetragona* is a Mallee of three feet in some places and a tree of thirty feet in others. The Jarrah, Karri and Tingle areas were mentioned and the high rainfall here, also the terrible devastation caused by close settlement, burning and the building of roads.

Mr. Fell spoke of the delineation divergence of the floral areas by Deal and Gardner. The talk was illustrated by pictures from the forest areas, the

Darling and Stirling Ranges, Bremmer Bay, Esperance sands, the estuaries of the Pallinup and Gardner Rivers.

Mr. Fell answered various questions. Then Mr. Fairhall thanked Mr. Fell for his interesting talk and beautiful pictures, saying how members were saddened by the devastation, and recalling a happy occasion of lunchtime in Mr. Fell's W.A. garden.

Botany Group Excursion to Anglesea and Airey's Inlet on 10-11 Oct. Members please bring \$3 deposit to group meeting on Thurs., 8 Oct.

Geology Group Excursions

Sunday, 11 October — To Heathcote and district (previously advertised for 9 August).

Sunday, 8 November — To Kinglake.

Leader: Mr. George Carlos.

Transport is by private car. Spare seats are usually available for those without their own transport. Excursions leave from the western end of Flinders Street Station, opposite the C.T.A. Building at 9.30 a.m.

No excursions are planned for **December, 1970, and January, 1971.**

Member for Fifty Years

All microscope enthusiasts and members of the Microscopical Group are invited to a special evening, the celebration of Mr. Cliff Nance's fiftieth year as a practical amateur microscopist, on 21 October.

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Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available, and other activities are indicated in reports set out in the several preceding pages of this magazine.

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Vol. 87, No. 11

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Front Cover:

This delightful photograph of the Sugar Glider was taken by John Wallace, of Caulfield.

Shore Potholes at Diamond Bay, Victoria

by

E. C. F. BIRD*

Potholes are smooth circular depressions scoured in a rock surface by fragments of rock circulated by the action of flowing water. They are often found in the beds of river channels, and also occur on rocky shores, where wave action generates the necessary water circulation. Shore potholes have been reported from various parts of the world (Dionne, 1964), and good examples are found on the ocean coast of the Nepean peninsula, on the southern side of Port Phillip Bay, Victoria (Fig. 1).

The Nepean peninsula consists of dune calcarenite, a sandy calcareous material otherwise known as aeolian calcarenite, calcareous aeolianite, or dune limestone. It has been built up as a sequence of overlapping dune formations, partially lithified by secondary carbonate deposition. Superficial unconsolidated dunes, some held in position by vegetation, others active and spilling landward, are of Recent age, but the underlying calcarenite contains fossil remains of extinct giant kangaroo species, and is of Pleistocene origin (Gregory, 1901).

The dune calcarenite includes sandy formations with strongly-developed dune bedding, homogeneous dune sandstones, and layers of hard calcrete rock, often with reddish-brown buried soil horizons (palaeosols) and relics of associated vegetation in the form of branched cylindrical root tubes preserved in calcrete (rhizoconcretions). Each of these formations is exposed on the ocean coast (Plate 1) where in

Recent times the southern margin of the peninsula has been cut back by marine denudation to form rugged cliffs fronted by almost horizontal shore platforms. Rocky promontories and stacks occur where the more resistant layers outcrop close to high tide level, and embayments such as Diamond Bay on intervening sectors where the less indurated dune sands have been scoured away by wave action between high and low tide level. The shore platform is broad and smooth where it is developed on homogeneous dune sandstone, but there are minor irregularities where it is crossed by outcrops of stratified dune sand and protruding reefs on outcrops of hard calcrete. Beaches

*Reader in Geography, University of Melbourne.

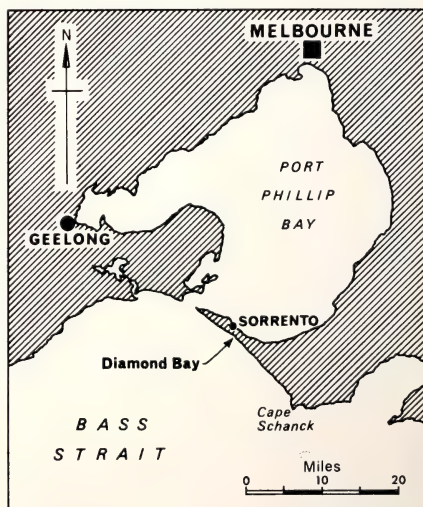


Fig. 1



Plate 1 Western shore of Diamond Bay, showing basal calcrete ledge with cylindrical depressions, overlying buried soil horizon, bedded dune sands with rhizoconcretions, and unconsolidated dune sands overlying another buried soil horizon near the top of the cliff.

are of limited extent, and consist of sand eroded from the cliffs, augmented locally by pebbles and cobbles formed from the more resistant calcrete layers.

Where this coarser material is available, potholes may be found on the adjacent shore. Stones lodged in crevices on the shore platform are moved to and fro by wave action, and as a hollow is scoured out the gravel becomes smoothed and rounded, and reduced in size by gradual attrition. The excavated hollows are typically circular in outline and hemispherical in shape. Neighbouring potholes may grow and coalesce through the breaching of

intervening ridges (Plate 2). Some potholes have been cut out by the agency of a single large stone, others by the circulation of a quantity of gravel (Plate 3). If the supply of abrasive material is maintained, cylindrical hollows may be drilled out to depths of more than a metre, but if the abrasive material is washed out during a major storm, or if it disappears as the result of continued attrition, the scouring process comes to an end and the pothole loses its smooth, freshly-scoured appearance. Potholes no longer subject to scour are usually colonised by marine plant growth, notably the sea grape, *Hormosira*.

As well as potholes produced by abrasion there are various other depressions produced by weathering processes. They include features classified as pits and pans by Went-

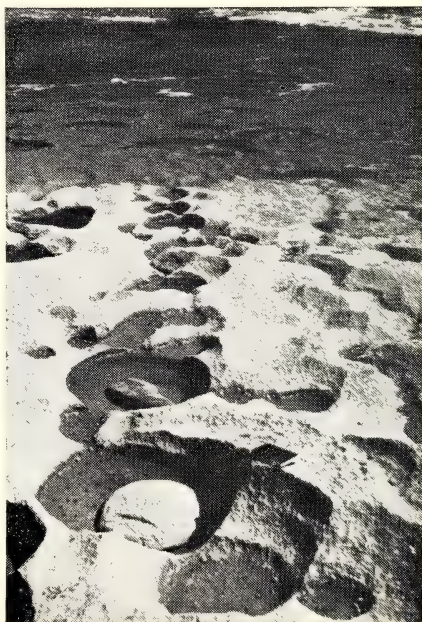


Plate 2 Shore potholes formed largely by abrasion.

worth (1940), marine solution basins by Emery (1946), and flat-bottomed pools by Guilcher (1958). Weathering processes involved in their formation include (1) rock disintegration through repeated wetting and drying, (2) the plucking effects of salt crystallization where sea water, trapped in a hollow above high tide level, evaporates during dry weather, (3) solution by rainwater, (4) solution by groundwater seepage, (5) solution by sea spray and swash, and (6) bioerosion, the physical and chemical effects of the plants and animals which inhabit the shore. Any of these processes may initiate and excavate depressions on the shore, or contribute in some measure to the enlargement of potholes formed primarily by abrasion. For example, the potholes shown in Plate 2 (a

photograph taken after a period of calm weather and low tides) contain shelly organisms which etch and scrape the rock walls when the scouring process is latent. The walls of these potholes are also intricately pitted, in a manner suggestive of corrosion. As a pothole is deepened by abrasion the freshly scoured surface migrates downward, leaving the upper parts of the wall, no longer subject to scour by rotating rock fragments, to be pitted by corrosion processes and colonised by shore plants and animals (Plate 3).

Analysis of the effects of the various weathering processes on this dune calcarenite shore is beyond the scope of the present article: the results of a detailed study are to be published subsequently. It is sufficient here to note that in addition to potholes produced entirely by abrasion and depressions produced entirely by weathering processes, there are hybrid forms. Some of the potholes which originated as the result of abrasion have lost their content of rock fragments and are now being enlarged by weathering processes, notably corrosion. Other features originated as weathering depressions, but were then invaded by rock fragments and enlarged and deepened as potholes by abrasion.

An unusual form of pothole is well developed on the western shore of Diamond Bay, where a calcrete layer, overlain by a buried soil horizon, outcrops in the base of the cliff and extends as a ledge along the flanks of a promontory (Plates 1 and 4). The calcrete ledge shows numerous cylindrical depressions, 30-50 cm. in diameter and often more than a metre deep (Plate 5). At first sight they look like potholes, and



Plate 3 Shore pothole containing abrasive gravels.

Plate 4

Calcrete layer
with cylindrical
depressions.



some of them have indeed been invaded by rock fragments and deepened by abrasion, but close examination of the calcrete layer at the base of the cliff shows that these cylindrical depressions have been derived from soil pipes found beneath the buried soil horizon (Plate 6).

Soil pipes are cylindrical hollows which develop in limestone terrain as the result of subsoil solution processes. Their probable mode of formation in Diamond Bay is shown

in Fig. 2. It is likely that they were initiated where shrubs or trees growing on the stabilized surface of a dune sent down prominent vertical roots through the surface soil into the underlying calcrete layer. When the plants died and these roots

Plate 5 Cylindrical depressions derived from soil pipes in a calcrete layer.



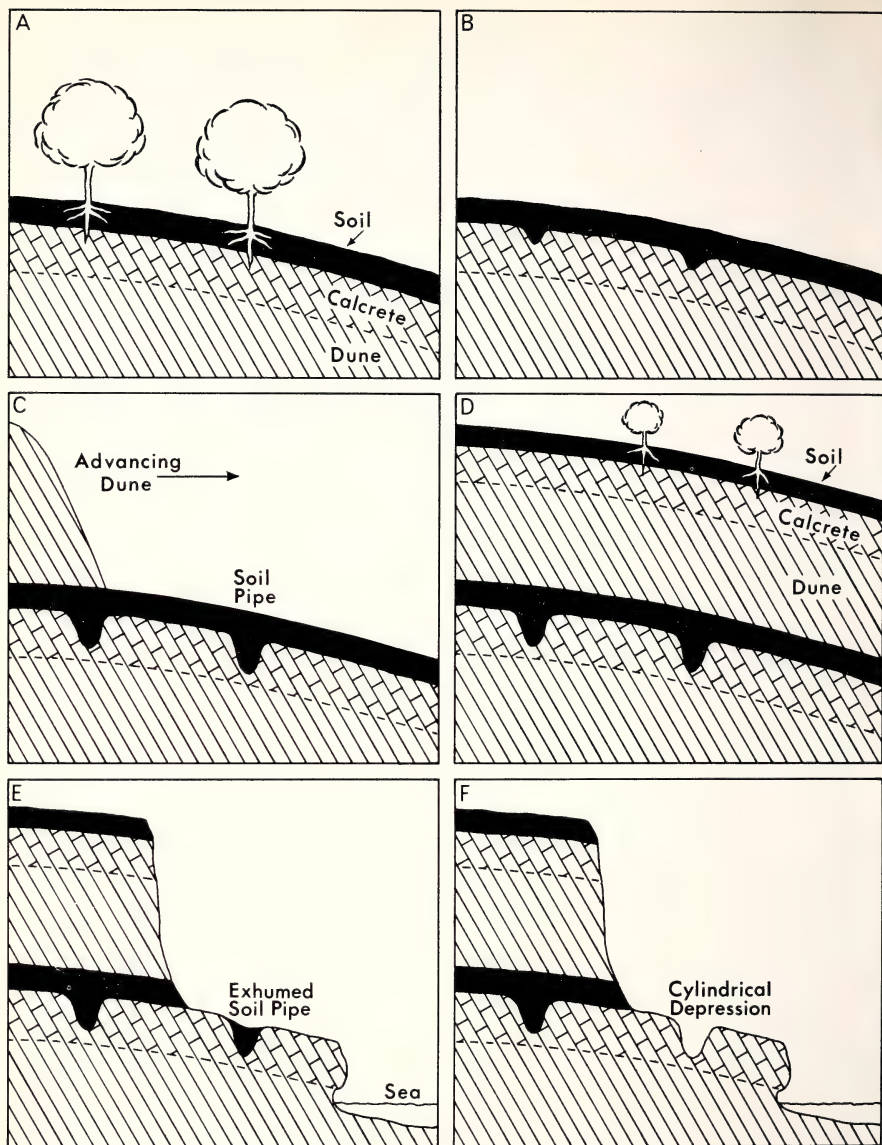


Fig. 2 Evolution of soil pipes and cylindrical depressions.

decayed, soil material subsided into the hollow thus produced, and percolating rain water, corrosive because of its dissolved content of atmospheric carbon dioxide, then drained through the hollow, progressively dissolving away calcium carbonate from its base. In this way the hollow steadily deepened, and more soil material was washed into it. At the same time, much of the dissolved calcium carbonate was precipitated in the underlying and bordering calcarenite in such a way as to form a strongly lithified surround.

The soil horizon, with its underlying soil pipes, developed during a past phase of stability in the dune landscape. It was buried, together with its associated vegetation, when a younger dune (indicated by the strongly-bedded dune sand in Plate 2) migrated across the area (Fig. 2, C and D). Development of the soil pipes was then arrested, for rain

water percolating through the overlying calcareous sand would be saturated with dissolved carbonates by the time it reached the buried soil, and thus incapable of further solution.

Much later, when marine denudation exposed the buried soil horizon and laid bare the calcrete layer, soft soil material was readily washed out of the soil pipes by wave action, thus producing empty cylindrical depressions (Fig. 2, E and F). Locally, at the base of the cliff, the calcrete layer has been undercut, and the cylindrical depressions are bottomless (Plate 7). Farther out, on a ledge bordering a promontory, the washed-out soil pipes are being enlarged by corrosion (Plate 5). Where the calcrete layer dips beneath high tide level, several of the washed-out soil pipes have acquired rock fragments that are circulated by wave action in such a way as to convert

Plate 6
Soil pipes
exposed in cliff
section.



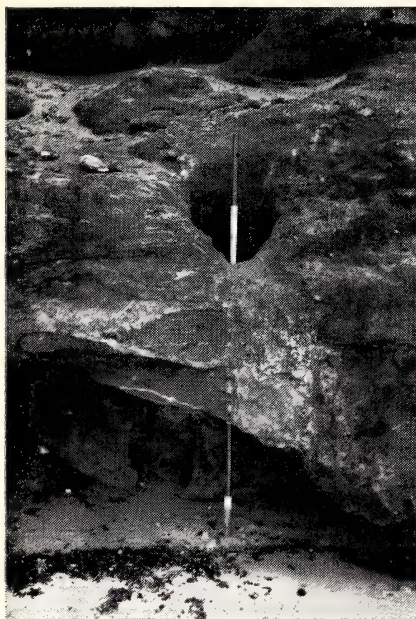


Plate 7 Cylindrical hollow in undercut calccrete ledge.

them into abrasion potholes. Towards low tide level, most of the washed-out potholes are choked with weed growth (Plate 4), and some have become filled with sand. In the middle of the bay, vase-like structures have developed (Plate 8) where the carbonate-enriched surround of washed-out clay pipes persists after the removal of surrounding, less indurated dune rock.

The shores of Diamond Bay thus show (1) potholes formed by abrasion, (2) depressions produced by weathering processes, (3) hollows formed by the washing-out of soil pipes and (4) depressions of composite origin.

Acknowledgement

I am grateful to H. J. Collier for assistance with the Figures, and N. Rosengren for help with the Plates.

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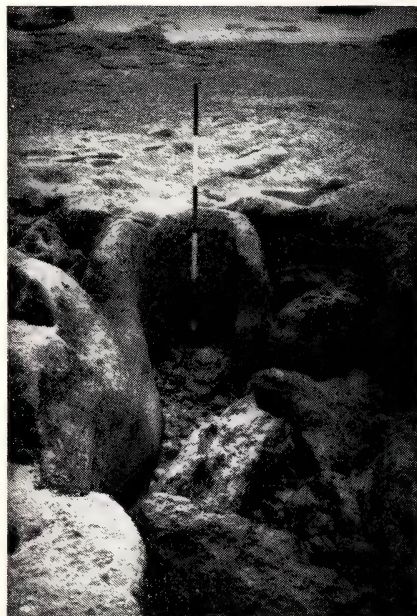


Plate 8 Vase-like structure left where indurated surround of a soil pipe persists after soil has been washed out and surrounding dune rock eroded away. Rock fragments have invaded the hollow, which is now being excavated as a pothole by abrasion.

Bird Notes on the Western Fringe of the Simpson Desert

by ELLIS M. TUCKER

On the 26 July 1968, our party led by Cliff Beaglehole (Portland), and comprising Bill Corrick (Hamilton), Stan Finck (Heathmere), and myself (Brit Brit), left Alice Springs on our homeward journey after five weeks of botanical collecting in various parts of the Centre. Our intention was to detour through the Western fringe of the Simpson Desert and make a plant collection from that area.

1968 was a remarkable season in Central Australia. After the breaking of the long drought the previous year, heavy and continued rain had transformed the area into a many flowered wilderness. Birds had also returned in large numbers. These were my main interest.

After receiving last minute directions and advice from Staff at the Herbarium, filling all petrol and water containers, we headed the Land Rover south beside the railway line.

Our first stop was to see the ancient rock carvings at Ewaninga; then on to an Easterly digression to the Ooraminna Rock-hole, where we camped for the night. This is a permanent waterhole set among low, rocky hills; and from the cave paintings and acres of camp debris, stone flakes, chips, and grinding stones, it was obviously used by generations of Aborigines as a camp site. It was also used by teamsters as a staging point during the building of the Overland Telegraph Line. At that time, it was the only permanent water between Dalhousie Springs and Alice Springs.

After some delay next morning for the drying of previously collected specimens, and to allow a quick hunt around the area, we packed and headed south again for Deep Well Bore. Here, our track turned to the east, past Deep Well and Allambi Stations. After travelling almost due east for approximately 80 miles, the rolling sandhill plains became wider. We cut the old "Oil Road" running S.S.E. and came through the gap in the last range to see the long straight lines of sandhills fading away to the southern horizon. We knew then that we had arrived in the Simpson Desert. We moved on a few miles until we found a dead tree for firewood, and with the sun setting behind the flat topped range to the north-west, camped.

At that spot, the surrounding country presented an almost park-like appearance. On the flats between the sandhills, which were approximately half a mile apart, there grew a scattering of thick foliated, upright acacias, from 15 to 20 feet high. Very little bare ground was to be seen. A thick carpet of grasses (*Aristida* — *Triraphis* — *Eragrostis* — *Enneapogon* — *Diplachne*), together with Barrier Salt-bush (*Enchylaena tomentosa*), Blue-bush (*Kochia*), Goodenias, Bassias, Sunrays (*Helipterum*), Twin-leaf (*Uygophyllum*), and even some Nardoo (*Marsilea*), with many other plants, covered the flats. Only the crests of the sandhills showed red sand ripples. The sides, especially the eastern side, being covered with masses of yellow flowered Groundsels (*Senecio grego-*

rii), Poached Egg Daisies (*Myriocephalus stuartii*), *Trachymene*, and great white masses of Cress spp. (*Cruciferae*). Ragged clumps of Sandhill Canegrass (*Zygochloa paradoxa*) and Roly-Poly (*Salsola kali*), both living and dead, had caught the drifting sand into hills and humps along the ridges.

Soon after dark, we became aware of what was to become one of the bird mysteries of the trip. The 'boo-hoo' calls of pigeons came in from all sides and persisted right through the night. Both with and without torches, we endeavoured to track down the callers, but could never quite locate them. The calls seemed to come from the acacias, but no birds could be seen or flushed. No pigeons had been seen while still light, nor were any seen in the morning, even though we were out at daylight. The call seemed to be that of the Forest Bronzewing, but why the birds would come out to that area to roost and move away before daylight, we could not imagine.

Our track that day ran for over fifty miles south-south-east in a straight line between thirty foot sand ridges. According to our maps we were going down hill at a little over one foot per mile!

To the east and west were exactly similar valleys and ridges, but from our 'road' (an old grader track with wheel tracks left by a Land Rover in the wet a month or so before), our world was limited to the ridges on left and right, with shimmering distance before and behind. But that valley was alive with interest!

Birds were in large numbers, masses of flowering plants and shrubs covered the sloping sides of the sandhills, small stunted trees grew sparsely over the valley floor, and later in the day, patches of

shallow water were encountered. As we came out on to a large plain, these became a swamp, with nesting Avocets, Banded Plover and Duck. We were glad then of the old Land Rover tracks, which we followed in a wide detour, for the 'road' disappeared under the waters of the swamp.

By the end of the day we had covered eighty miles, and had turned west to camp a few miles short of the ruins of the deserted "Old Andado" station. For the one day, our bird list totalled 43 species, with our count of individuals at 1,068. This number was from one valley! A valley which in no way differed from the ones on either side; nor the ones on the other side of those. If the hundreds of valleys each contained roughly the same numbers, the bird population of the Simpson Desert at that time must have been little short of astronomical!

Crimson Chats, those brilliant little birds of the out-back spaces, were nesting in the tangled heaps of Roly-Poly (*Salsola kali*). Brown Songlarks, approximately a pair to the mile while the thick cover of the perennial grasses lasted, sang their clockwork song and were no doubt nesting, although no nests were seen. Budgeryghs, too, were feeding all through the grassy flats. They also became less as we travelled south into the swampy areas, and the grasses lessened as the ground cover began to show some effects of salting. It was here we first saw the Orange Chats, which always show a preference for that type of habitat.

As we came south, the tree cover of the valleys became more stunted. The taller acacia species gave way to lower, bushy shrubs, *Cassia*, *Eremophila*, *Hakea*, *Grevillea*, *Crotalaria*, and *Solanum* were encountered; and it was in this type of

habitat we saw Zebra Finches, White-rumped Miners, White-winged Trillers, Singing Honeyeaters, Hooded Robins and Crested Bellbirds. Two small parties of Cockatiels were seen, also a number of small groups of Galahs. These, with the Budgerygahs, always seemed to be moving in a westerly direction. In one sparsely covered, stony area, a Cinamon Quail-thrush was seen. Strangely, no Wedge-tailed Eagles were seen, although a huge nest — possibly an old one — was seen in a small acacia, giving the tree a very top-heavy appearance. Brown Hawks, Kestrels and Spotted Harriers were seen at odd intervals right through. Only one Black-shouldered Kite was seen. Willie Wagtail, of course, was there; as also were Pipits. I doubt if any part of out-back Australia could be visited without seeing these two. As for the few Magpies seen, we could never be sure whether they were Black-backed or White-backed, for no two birds seemed to carry the same markings.

Near one bare stony area, with a film of shallow water, two Australian Dotterels were seen. By their behaviour we believed they had a nest, but it could not be found. In the same spot we flushed an Australian Snipe, a bird which should not have been there at that time of the year. It was also in this area that we found the only eucalypt; stunted and twisted in growth to almost a Mallee form, which, in the absence of fruits, we mistook for a River Red Gum. However, this was later identified at the Alice Springs Herbarium as *E. microtheca*.

A number of parties of Fairy Wrens were closely observed. Very few of these were in breeding plumage, and the only positive identification made was of the Blue and White Wren. These always favoured the

tangled clumps of Sandhill Cane-grass (*Zygochloa paradoxa*), which in some places were up to six feet high, and covered a considerable area. As we met the swampy area to the south, the sandhills on our left faded away, leaving a vast featureless plain away to the south-east. Across this, a single Dingo hurried away.

Here, we turned west, and after detouring around large sheets of water, pursued by excited Avocets and Banded Plovers, we were forced to travel on for several miles after dark before finding two small dead Mulgas for our camp fire.

In the morning, the sunrise from the top of a sand-ridge was a sight I shall never forget. The sun rose over mirror like sheets of water to the east, and the first rays made the sandhills behind me glow to an almost luminous red. The view in front reminded me of pictures I had seen of the Arctic tundra, making it hard to realise I was looking out over an Australian desert.

From this camp the only addition to our bird list was at the ruins of the "Old Andado" homestead. This had been completely taken over by Fairy Martins, and under every remaining roof their bottled-shaped mud nests covered all available space. One-hundred-and-two birds hawking insects over a nearby pool were counted.

The following is our bird list for the one day — 28/7/68:

Little Quail	1
Crested Pigeon	4
Banded Plover	8
Aust. Dotterel	2
Red-necked Avocet	29
Aust. Snipe	1
White faced Heron	4
Grey Teal	6
Spotted Harrier	4
Black shouldered Kite	1
Brown Hawk	9
Nankeen Kestrel	6

Galah	70	Blue and White Wren	10
Cockatiel	15	White-browed Woodswallow	4
Budgerygah	352	Masked Woodswallow	4
Pallid Cuckoo	3	Black-faced Woodswallow	20
Bronze Cuckoo Sp.	2	Singing Honeyeater	10
Welcome Swallow	1	White-plumed Honeyeater	2
Willie Wagtail	4	White-rumped Miner	14
Hooded Robin	3	Spiny-cheeked Honeyeater	1
Western Thrush	2	Aust. Pipit	10
Crested Bellbird	2	Zebra Finch	57
Little Cuckoo Shrike	1	Aust. Crow	57
White-winged Triller	15	Magpie (W-B? B-B?)	5
Cinnamon Quail-thrush	1		
Crimson Chat	195		
Orange Chat	42		
Chestnut-tailed Thornbill	4		
Yellow-tailed Thornbill	6		
Brown Songlark	86		
Rufous Songlark	1		

Acknowledgement:

My thanks are due to Cliff Beaglehole for supply all botanical identifications and checking all references.

Breeding of Common Wombat in Captivity

by

P. CONDER

Although the Common Wombat is a relatively common sight in zoos, it rarely breeds in captivity. The animals pictured are in the Sir Colin MacKenzie Sanctuary, Healesville.

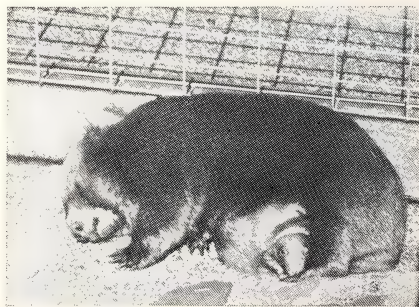
The Wombats, aged approximately seven years (male), and five years (female), mated on 9 June, 1969, some two or three years after the birth of their last cub. It was not until December that the youngster was first noticed. Throughout the ensuing months it could be observed, to begin with, moving within the pouch, then later a foot or snout often protruded, as the female progressed about her enclosure or lay in her sleeping compartment. Eventually, the young wombat began to venture forth from the pouch for short periods, usually at night but occasionally during the day, particularly in hot weather.

In early April the youngster, a female weighing seven pounds, vacated her mother's pouch. She grew rapidly, gaining five and a half

pounds in three weeks, but for some time would not move further than a few feet from the female. At the time of writing, the young wombat is almost half the size of the adult, and completely independent of her parent.

Acknowledgement

The author wishes to thank Mr. P. McPhee for supplying the information on which this note is based.



Mother, and baby wombat at approximately six months of age.

Photo: P. McPhee.

My Stolen Heritage

This is the end of September 1970, and I have just returned from the bitterest experience in many years of Naturalist activity. I have returned from a 250-mile round day trip taken with a friend, one aim of which was to enjoy again myself, and to introduce another to the lovely Leafy Greenhood (*Pterostylis cucullata*). I have visited the spot a number of times, never to be disappointed, and sometimes to be greeted with a wonderful display.

This time I saw nothing — nothing but holes! Hundreds of holes, where there should have been flowers, or at least leaves to mark their future presence. In the two years since my previous visit this denudation has taken place, much of it obviously this year. The area concerned is within the boundaries of the Wilson's Promontory National Park.

This comes as the unbelievable culmination to a number of similar events noted over a few years, some of which I list here:

(1) 10 to 15 plants of the Metallic Sun-orchid (*Thelymitra epipactoides*) dug from a Western District Crown Land cliff top;

(2) about a dozen rare and recently re-discovered Beard-orchids dug from Rushworth Forest;

(3) another less rare, but still uncommon Beard-orchid removed from a Gippsland roadside area;

(4) many species including a goodly number of the Tall Leek-orchid (*Prasophyllum elatum*) taken

from privately owned land and Water Reserve near Belgrave.

I wonder how these people described themselves! Scientists? But no scientist destroys entirely the thing he studies.

Photographers? If so, it is surely unnecessary to take such numbers.

Naturalists? Never! The true naturalist has always been remarkable for the gentleness of his touch upon his environment.

The only conclusion to draw appears to be that the plants must be taken for trading or exchange.

These people whoever they may be are nothing more or less than selfish, selective and systematic destroyers of the natural environment, despoiling areas that have for years been a source of interest, research and joy to unknown numbers of people. I hope they are satisfied when they think of a bushland area, bare of the natural heritage they have stolen from those who loved and cared, a heritage lost to coming generations through their selfishness. I hope, too, that they are satisfied with the heritage of mistrust they have left in the hearts and minds of those who trusted them.

I have discussed this latest devastation with certain of the Park Trustees, and have been assured that those in charge will be alerted and stern measures taken over such occurrences. Heartening as this is, it does not bring back that which is lost.

C. E. GRAY.

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Studies in Australian Lichens - 1

by

REX B. FILSON*

In preparation of a monograph of the genus *Cladia* it is necessary to describe two species as new and to make one new combination. As the completion of the monograph will be delayed for some time it is thought best to validate the names by publication herein so that Australian workers can make use of them. Full descriptions, affinities, chemistry and distribution will follow in the later paper.

Four species of *Parmelia* commonly discussed in ecological papers need name changes to *Hypogymnia* and the combinations have been made accordingly.

Cladia corallaizon R. Filson sp. nov.

Clathrina retipora var. *corallaizon* F. Wilson ms.

Species nova ex affinitate *C. retiporae* differt sic: pseudopodetiis crassioribus rigidioribus, fenestellis par-

vioribus regularius separatis, atque colore viridi-griseo usque stramineo.

HOLOTYPE — Narrandera — West Wyalong road, 28 miles north of Ardlethan, New South Wales *Rex Filson* 5466 13.10.1963 (MEL 25246).

Thallus fruticose, composed of pseudopodetia up to 5cm. high, in pulvinate clumps up to 12cm. in diam. or occasionally in scattered clusters 3-4 cm. in diam., greenish-grey becoming stramineous with age; *Sterile pseudopodetia* rigid, when dry, horny, 2-3 mm. diameter, dichotomously branched, walls perforate, perforations narrow elliptic, regularly spaced *Cortex*: up to 100 μ thick: *Algal layer* discontinuous, 50-60 μ thick, cells 8-12 μ diam.: *Medulla* compact below the algal layer and loosely filling the whole of the hollow

*National Herbarium of Victoria.

Explanatory Note:

Since the publication of the paper on the Distribution of Epiphytes on Beech Trees at Mt. Donna Buang, several errors have been discovered or have been pointed out. In addition additional specimens of collections were found which have improved the data considerably. It was therefore decided to have the whole paper reprinted as a lift-out that could replace pages 253-268 in the September issue.

The Distribution of Epiphytes on Beech (*Nothofagus cunninghamii*) Trees at Mt. Donna Buang, Victoria

by

DR. D. H. ASHTON* AND R. F. McRAE*

The zonation of bryophytes, lichens and ferns was recorded in 1963 on recently fallen Beech trees at 3,000 ft. on Mt. Donna Buang, Victoria. The site is wet and frequently mist-laden, and being on a steep southern slope, it receives little direct sunlight on hot summer afternoons.

Beech trunks are frequently gnarled and corrugated and the original plates of bark from younger stages may adhere between multiple fissures. There are therefore many microhabitats for epiphyte establishment, especially amongst the convoluted roots, burls and buttress-like swellings. Some aspect differences were observed on the tree trunks in more exposed positions, but these were not specifically studied. The density and diversity of epiphytes in this forest is considerable, but is much less than that in Tasmanian Beech forests. Two new bryophyte records for the Australian mainland are here reported. We are indebted to Mr. J. H. Willis for pointing out that *Frullania rostrata* is a new liverwort record, and to Dr. Ilma Stone for determining the new moss record, *Ulota cochleata*.

1. *The relationship between tree girth at breast height and butt epiphytes.*

In general the number and profuseness of epiphyte species increases with the size of the trunk. Four to five species were found on trees less than 1 ft. g.b.h. up to heights of 6 ft. However, on trees of 8-10 ft. girth this number was doubled (Table 1). This relationship is probably due to the greater diversity of habitat on the thicker-barked, larger and older trees, but it could also be related to the minimal area for the epiphyte communities.

In general the larger and more frondose liverworts were found at lower levels on the trunk where fern establishment was also more common. The finger fern, *Grammitis billardieri* was found at the lower levels and, also, occasionally the soft tree-fern *Dicksonia antarctica*. The smaller trunks were often surrounded by dense ground ferns (*Polystichum proliferum*) which cast considerable shade around the butt. The large tree bases, on the other hand, tended to be relatively free of ground ferns. There is therefore a large variation in local butt microclimate.

*Botany School, University of Melbourne.

The quantity of trunk-flow, its seepage down furrows and its retention in the thicker bark and humus accumulation in crevices are added complications of the microenvironment.

In general the butt communities were dominated by *Dicranoloma billardieri*, *D. menziesii*, *Bazzania adnexa* and *Plagiochila fasciculata* with the lichens *Pseudocyphellaria glabra* (syn. *Sticta glabra*) and *Stereocaulon ramulosum* forming conspicuous patches. The liverwort *Acrobolbus tenellus* (syn. *Tylimanthus tenellus*) is often quite common at the lower levels. The lower strata of the epiphyte communities consist of low mats of varying density of *Chiloscyphus echinellus*, *Gackstroemia weindorferi* (syn. *Lepidolaena magellanica*), *Frullania rostrata* and *Hypnum cupressiforme*.

2. Vertical distribution of epiphytes. (a) Large trees.

The vertical distribution of epiphytes was recorded at 1-2 ft. intervals along the south to west aspects of the trunk and branches of a tree 95 ft. in height and 8 ft. in girth at breast height. The width of bark quadrats diminished with the taper of the tree from 18 inches at the butt, to 9 inches in the mid trunk, 3 inches in the crown and $\frac{1}{4}$ inch in the fine branches.

Each plot was one foot long and species were estimated on the Braun Blanquet* scale of + to 5 of increasing cover. The trees studied represent only a small sample of the forest and individual trees differ considerably in their epiphyte population. It is possible that some species on the trunks were not recorded due to the sampling procedure. The conspicuous foliose lichen *Pseudocyphellaria bil-*

lardieri up to 12'' diameter, was not recorded, although it was present on other trees.

The results in figure 1 show that the frondose butt-community was dominated by the liverworts *Bazzania adnexa*, *Acrobolbus tenellus*, and the moss *Dicranoloma billardieri*. The epiphyte zone of the trunk consisted of a complex mat and lichen community dominated by *Frullania rostrata*, *Hypnum cupressiforme* and the lichens *Pseudocyphellaria glabra*, *Menegazzia pertusa* (syn. *Parmelia pertusa*) and *Hypogymnia physodes* (syn. *Parmelia physodes*), *Sphaerophorus tener* and *S. melanocarpus*.

The change to this community roughly corresponded to the level of the ground-fern canopy. Within the mat and the lichen zone there is a graduation of both the species and their abundance. In this zone *Cladia aggregata* tends to occur at lower levels and *Metzgeria furcata* at higher levels. Some feet below the commencement of the crown, small plants of the moss *Leptostomum inclinans* also occur.

The crown region microhabitats are complicated by the accumulation of humus in the angles of the branches. On the trunk and main branches the epiphyte community is dominated by cushions of *Leptostomum inclinans* (up to 3-6 inches in diameter) and mats of *Hypnum cupressiforme*. The lichens *Hypogymnia physodes*, *Parmelia perforata* and *Menegazzia pertusa* are also common. This community continues on the moderately small stems 3-4 inches in diameter on both the main trunk and the lateral branches. On the latter the *Leptostomum* cushions are situated on the upper side and the fronds of *Hypnum* trail down

* (+ = 0-1%, 1 = 1-5%, 2 = 5-25%, 3 = 25-50%, 4 = 50-75%, 5 = 75-100%).

either side in long whisps. It is probably that the reduction of many species in this zone is due to the competition provided by the luxuriant cushions of *Leptostomum inclinans*.

On the finer branches the community becomes more open and consists of tufts of *Leptostomum inclinans*, *Ulotia lutea* and *U. cochleata* with small colonies of *Menegazzia pertusa* and *Usnea florida*. On the ultimate branches only sparse simple erect thalli of *Usnea florida* occur with occasional crustose lichens, *Lecidea cinnabarina* and *Phyllectella* sp.

(b) Small trees.

Small trees 10 to 23 feet in height were also examined and were found to show a similar pattern to the large tree. In the small tree the zonation of species is greatly foreshortened. Small colonies of frondose bryophytes occurred up to 5 ft. on the 23 ft. tree and 2 ft. on the 10 ft. tree. The trunk community again is composed of *Frullania rostrata*, *Hypnum cupressiforme* and *Pseudocyphellaria* species. *Leptostomum inclinans* cushions are not common on the crowns of the 23 ft. tree and are absent from the 10 ft. tree. The fine branch and twig zone contains *Usnea florida* and *Hypnum cupressiforme* and "white-wash" crustose lichens (*Phyllectella*) (Fig. 2). In general, the conspicuous foliose lichens and tuft moss components of the tall crowns of the forest canopy are missing.

(c) Corticolous succession.

The earliest colonizers are found on 3-year-old branches and are chiefly *Usnea florida* and "white-wash" crustose lichens. At this stage the *Usnea* thalli are only 1 mm. high. On 5-6 year branches they are 2-5 mm. in height and are associated

with small *Menegazzia pertusa* and *Ulotia cochleata* colonies. From about 10-13 years *Usnea* is branches 10-15 mm. high and associated with *Hypogymnia physodes* and *Parmelia perforata* and *P. tenuirrima*. From 13-18 years on thicker branches, the crown community is well developed with the occurrence of *Hypnum cupressiforme* and *Frullania rostrata* (Fig. 3). *Usnea* and the crustose lichens virtually disappear. In general the lower branches establish a crown community a few years earlier than the upper branches and the horizontal branches develop a much more vigorous community than the vertical branches.

The rate and extent of development is likely to be greatly affected by the local microclimate in the crown. Succession to cushion moss communities on horizontal branches usually only occurs on the upper surface. The lower areas are shaded and drier and bear only simple algal or soredial lichen communities. It is possible that the cushion community dominated by *Leptostomum inclinans* becomes unstable with age and cannot fully recolonize the vertical trunk once the earlier crown branches have fallen. If this is so, the epiphyte communities could develop a lower and more open mat community dominated by *Hypnum* and *Frullania*. The bark flakes of the original young stem may still adhere to the mature trunk and may bear crustose lichens such as *Pertusaria* which may be relics of the earlier communities. It seems that succession in the true sense does not proceed beyond the branch stage since new surfaces are being constantly created by expanding bark furrows of the trunk.

The Relationship between Epiphytes and Environmental Factors:

The documentation of the Beech tree environment within the forest would have been of great interest. However, it was only possible to investigate a few relevant factors.

Bark thickness on the large tree ranges from 8-9 mm. on the butt to 5-6 mm. on the mid trunk, to 3-4 mm. in the crown and 1-2 mm. in the small branches. The twigs have a bark thickness of only 0.2-0.8 mm. The moisture content of the outer bark in winter was near saturation

at 70-79% O.D.W. in the crown and 53-69% at the butt. It is likely, however, that the lower bark would have a greater moisture storage due to its greater thickness. In addition, the greater shade, lower temperatures and windspeeds at lower levels in the forest trunk space would be conducive to the development of a marked gradient of humidity.

In order to test the relative resistance of various crowns and butt species to desiccation, several fronds and thallus pieces of different species were suspended over concentrations of sulphuric acid such as to provide

EPIPHYTE DISTRIBUTION ON A BEECH TREE DOMINANT AT M^l DONNA BUANG

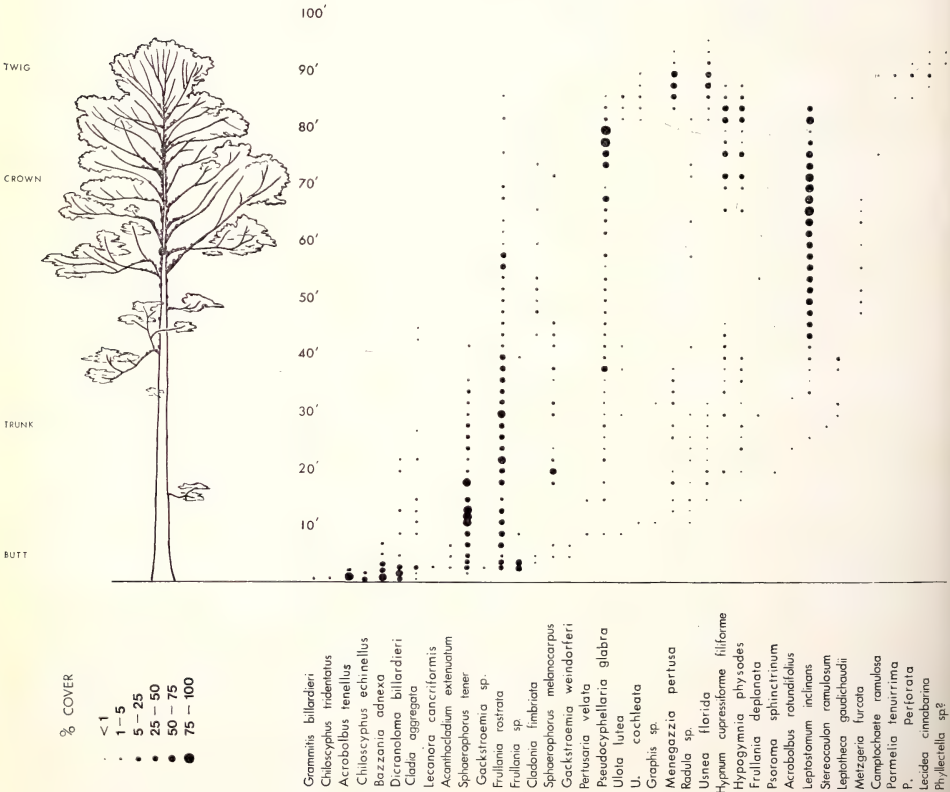


Figure 1.

relative humidities of 0, 25, 50, 75% at 6°, 20° and 32°C. The epiphytes were exposed to these conditions for 3, 12 and 24 hours then re-moistened and their condition assessed qualitatively on a 3 point scale Table 2. The results showed that the species from the butt habitat — *Bazzania adnexa*, *Cyathophorum bulbosum*, *Dicranoloma billardieri*, *Gackstroemia weindorferi* and *Pseudocyphellaria glabra* were much more sensitive to desiccation than the trunk and crown species *Hypnum cupressiforme*, *Frullania rostrata*, *Leptostomum inclinans* and *Cladia aggregata*.

Even desiccation at 75% discriminated between the two groups. At 50% R.H. damage to both groups increased but the differences remained very marked. Damage at

25% was greater again, but beyond this no increase occurred in the aggregate assessment.

The effect of temperature on the damage sustained was fairly marked. At 32°C damage was distinctly greater than at 20°, but little difference occurred between 20° and 6°C. Time was an important factor. Damage increased greatly from 3 to 12 hours desiccation thereafter little further damage occurred.

The results indicate that *Cyathophorum bulbosum* is the most sensitive species tested, followed by *Gackstroemia weindorferi*, *Bazzania adnexa*, *Dicranoloma billardieri* and *Pseudocyphellaria glabra* in that order. The most resistant species tested was *Cladia aggregata* followed by *Leptostomum inclinans*, *Frullania rostrata* and *Hypnum cupressiforme*.

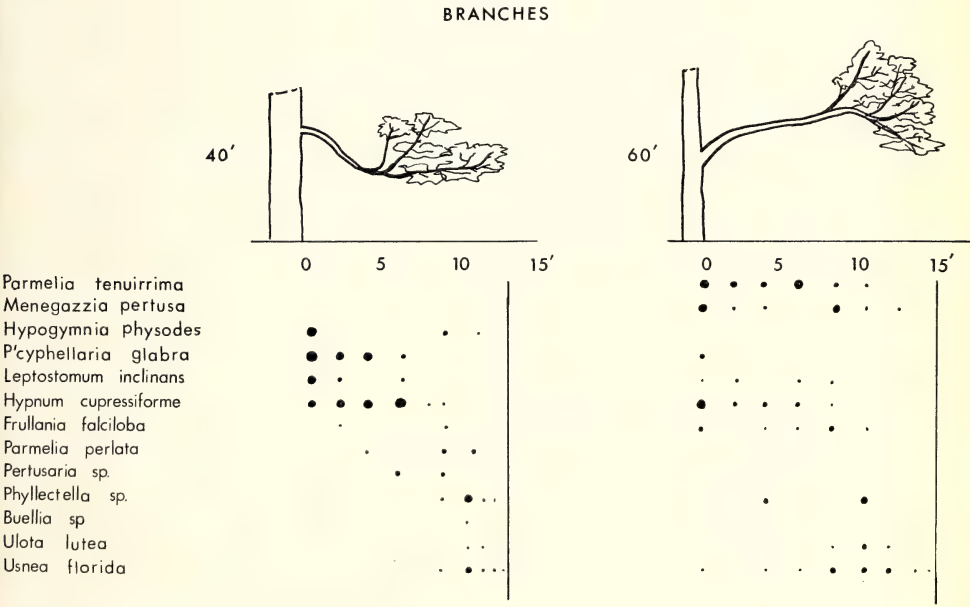


Figure 2.

It is likely that resistance to desiccation is an important feature in the ecology of epiphytes. The larger frondose species are unable to transport water internally from the substrate and are reliant on free water and the high humidity of the air for their continued survival. The killing or continual damaging of the larger species could permit the smaller and often more resistant species to compete and survive. Epiphytes are often sensitive indicators of microclimate; further research on their behaviour would be very rewarding.

SUMMARY

The epiphytic communities on Beech trees (*Nothofagus cunninghamii*) can be divided into butt, trunk, crown and twig communities. Within and between any zone,

gradations of species occurrence and profusion can be observed. Corticolous succession can be postulated for the development of communities on branches. A desiccation experiment suggested that marked differential resistance occurs between species normally found on the butt and trunk-crown regions. Such differences in behaviour could be decisive factors in the zonation of epiphytes on the trunk-space of the forest.

Acknowledgements

We gratefully acknowledge the identifications of lichens by Mr. R. Filson, liverworts by Mrs. E. A. Hodgson and mosses by Dr. I. Stone and Mr. J. H. Willis. We are indebted to Mr. J. H. Willis for his helpful and pertinent criticisms. The senior ecology class of 1963 assisted with some of the field work.

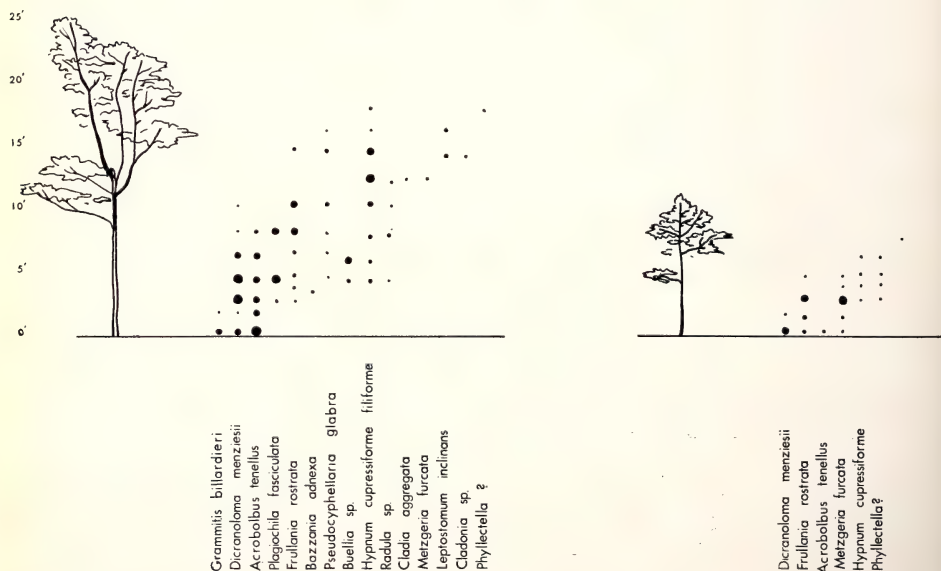


Figure 3.

TABLE 1
Epiphytes on Beech Butts of different size.

Ht. GBH	0 - 2 ft.					4½ - 6 ft.				
	0-1	3-4	6-7	8-9	>10	0-1	3-4	6-7	8-9	>10
<i>Acrobolbus tenellus</i>	x		x	x						
<i>Dicranoloma menziesii</i>	x	x		x			x		x	
<i>Dicranoloma billardieri</i>	x		x	x			x	x	x	
<i>Acrobolbus rotundifolius</i>		x	x	x	x	x	x	x		x
<i>Hypnum cupressiforme</i>						x				
<i>Pseudocypbellaria glabra</i>			x		x	x	x	x	x	
<i>Sphaerophorus melanocarpus</i>				x		x	x	x	x	
<i>Plagiochila fasciculata</i>		x	x	x			x	x	x	
<i>Frullania rostrata</i>		x			x		x	x	x	x
<i>Cladia aggregata</i>		x		x	x		x	x		
<i>Bazzania adnexa</i>			x	x	x				x	
<i>Grammitis billardieri</i>			x	x	x					
<i>Chiloscyphus echinellus</i>			x		x			x		
<i>Radula</i> sp.							x			x
<i>Stereocaulon ramulosum</i>					x		x			
<i>Sphaerophorus tener</i>									x	x
<i>Gackstroemia weindorferi</i>				x	x			x	x	
<i>Lepicolea scolopendra</i>									x	
<i>Lophocolea australis</i>									x	
<i>Pertusaria velata</i>										x
<i>Metzgeria</i> sp.										x
<i>Rhizogonium minioides</i>										x
<i>Cladonia squamata</i>					x					
<i>Dicksonia antarctica</i>					x					

Footnote for table 2 (pages 260-261).

ORDER OF SPECIES:

Crown species

- (a) *Hypnum cupressiforme*
- (b) *Frullania rostrata*
- (c) *Leptostomum inclinans*
- (d) *Cladia aggregata*

Butt species

- (e) *Cyathophorum bulbosum*
- (f) *Dicranoloma menziesii*
- (g) *Gackstroemia weindorferi*
- (h) *Stereocaulon tener*
- (i) *Bazzania adnexa*

TABLE 2

Damage to Epiphytes at Different Temperatures and Relative Humidities.

x Damage Slight or none.

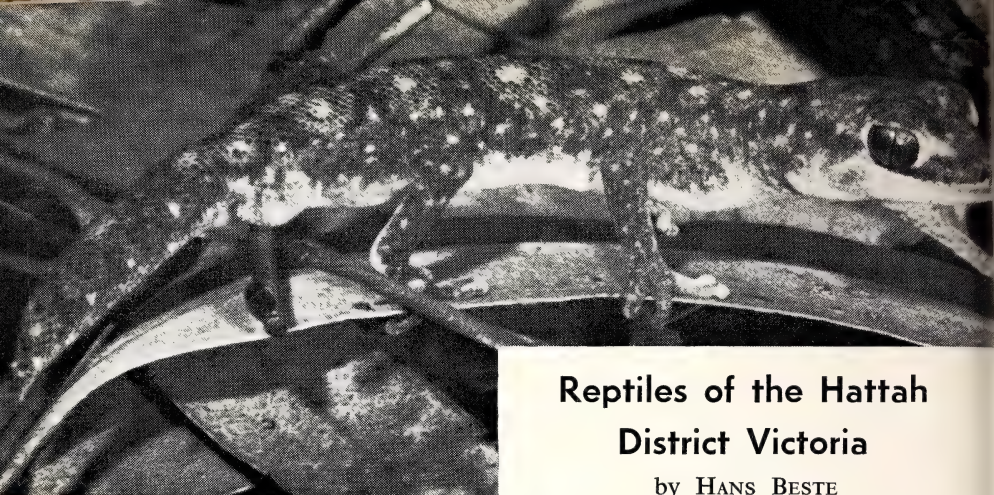
xx Damage Moderate.

xxx Dead.

Species (a) - (i): see footnote page 259.

Rel. Humidity Temp.	Time	0% R.H.		25% R.H.		50% R.H.		75% R.H.		100% R.H.	
		Crown	Butt	Crown	Butt	Crown	Butt	Crown	Butt	Crown	Butt
32° C	3 hours	(a) xx	(e) xxx	xx	xxx	xx	xxx	x	xx	x	x
		(b)	(f) xxx	x	x		x	x	x	x	x
		(c) xx	(g) xxx	x	xx	x	xx	x	xx	x	x
		(d) x	(h) xx	x	x	x	x	x	x	x	xx
			(i) xxx		xx		xx		x		x
	12 hours	(a) xx	(e) xxx	xxx	xxx	xxx	xxx	x	xxx	x	x
		(b) xx	(f) xx	xxx	xxx	xxx	xxx	x	x	x	x
		(c) x	(g) xx	xx	xxx	xxx	xxx	x	xx	x	x
		(d) xx	(h) xxx	xxx	xxx	xxx	xxx	x	x	xx	xx
			(i) xx		xxx		xx		x		x
	24 hours	(a) xx	(e) xxx	xx	xx	xx	xxx	x	xxx	x	x
		(b) xx	(f) xx	xx	xx		xx		xx	x	x
		(c) x	(g) xx	x	xxx	x	xx	x	xxx	x	x
		(d) x	(h) xx	xx	xx	x	x	x	xx	xx	xx
			(i) xx		xx		xx		xx		x

20° C	3 hours	(a) x (b) x (c) x (d) x	(e) xx (f) xx (g) xx (h) xx (i) xx	x x x x	xx x xx x x	x x x x	x x x xx x	x x x x x	x x x x x	x x x x x
	12 hours	(a) x (b) x (c) x (d) x	(e) xxx (f) xx (g) x (h) x (i) xx	x xx x x	xxx xx xx x xx	x x x x	xx x xx x xx	x xx x x x	x x xx x x	x x x x x
	24 hours	(a) x (b) x (c) x (d) x	(e) xxx (f) xx (g) xxx (h) x (i) xx	x x x x	xx xx xx x xx	x x x x	xx x xx x xx	x x x x x	x x x x x	x x x x x
6° C	3 hours	(a) x (b) x (c) x (d) x	(e) xx (f) xx (g) xxx (h) x (i) xx	x x x x	xx x xxx x xx	x x x x	xx x x x x	x x x x x	x x x x x	x x x x x
	12 hours	(a) xx (b) x (c) x (d) x	(e) xxx (f) xx (g) xx (h) x (i) xx	x x x x	xxx xx xx x xx	x x x x	xxx xx xx x xx	x xx x x x	x x xx x x	x x x x x
	24 hours	(a) xx (b) xx (c) x (d) x	(e) xxx (f) xx (g) xxx (h) x (i) xx	xx x x x	xxx xx xx x xx	x x x x	xx x xx x xx	x xx x x x	x x x x x	x x x x x



Reptiles of the Hattah District Victoria

by HANS BESTE

A total of fifty-two days was spent by the writer and an additional party of two in the Hattah region of N.W. Victoria, during three fieldtrips between 16 September and 4 December 1969. A particular effort was made to locate and identify as many reptiles as possible, and although 26 species were found in a rather restricted area, these are by no means the only reptiles that have been found in that part of the state.

The areas studied were a 180,000 acre leasehold at Hattah, the environs of Hattah, and a freehold of 1,300 acres on the River Murray.

The first two areas can be des-

cribed roughly as mallee with open plains, and the third as River Red Gum flood plains. The weather was mostly mild during the time spent in the area, which would have contributed to the fact that reptiles were sometimes rather scarce, and that some species that are known to be in the area were not sighted at all.

The elapine generic names are those as adopted by P. A. Rawlinson (1966) i.e. (Kinghorn 1956) and subsequent changes in scincidae (pers. comm. Rawlinson). Not all of the species found have common names, but wherever possible a common name is given, without following any particular author.

The Title Block illustrates the gecko *Diplodactylus tessellatus*.

CHELONIA

CHELYIDAE

- Chelodina expansa* (Broad-shelled Tortoise)
Chelodina longicollis (Long-necked Tortoise)
Emydura macquarrii (Macquarrii Tortoise)

Area where found

(See Fig. 1)

3
3
3

SQUAMATA

LACERTILIA

AGAMIDAE

- Amphibolurus barbatus* (Bearded Dragon)
Amphibolurus fordi (Mallee Dragon)
Amphibolurus muricatus (Jacky Lizard)
Amphibolurus pictus (Painted Dragon)
Physignathus gilberti (?)

1, 2, 3
1
1, 2
1, 2
1

GEKKONIDAE

<i>Diplodactylus strophurus intermedius</i>	2
<i>Diplodactylus tessellatus</i>	3
<i>Gehyra variegata</i> (House Gecko)	1, 2, 3
<i>Diplodactylus damaeus</i> (Beaded Gecko)	1, 2
<i>Phyllodactylus marmoratus</i> (Marbled Gecko)	3

PYGOPODIDAE

<i>Delma fraseri</i> (Fraser's Legless Lizard)	1
<i>Lialis burtonis</i> (Burton's Legless Lizard)	1, 2

SCINCIDAE

<i>Ablepharus boutonii</i> (Wall Lizard)	3
<i>Ablepharus lineoocellatus</i>	1, 2, 3
<i>Egernia inornata</i> (Desert Skink)	1
<i>Ctenotus lesueurii</i> (Striped Skink)	1, 2
<i>Ctenotus</i> sp? (a specimen of an undescribed species was collected)	1
<i>Tiliqua occipitalis</i> (Western Bluetongue)	1
<i>Tiliqua rugosa</i> (Shingleback)	1, 2, 3

VARANIDAE

<i>Varanus gouldii</i> (Gould's Sand Goanna)	1, 2, 3
<i>Varanus varius</i> (Lace Monitor)	3

OPHIDIA

ELAPIDAE

<i>Demansia textilis</i> (Common Brown Snake)	1, 2, 3
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TYPHLOPIDAE

<i>Typhlops australis</i>	2
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Acknowledgements:

The author wishes to thank the following people for the help that they have given him and his party, while doing the field study and by helping with the identification and naming of some of the specimens.

Mr. and Mrs. H. McArthur, for giving kind permission to camp on their properties and for the assistance which they gave us during this time.

Mr. P. A. Rawlinson, for helping with the identification and naming of some of the difficult specimens.

Mr. J. Coventry of the National Museum, Melbourne, for suggesting methods of finding certain species and without whose help this list may well have been shorter.

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- Kinghorn, J. R., 1956. The Snakes of Australia. 2nd Ed. Sydney. Angus & Robertson.
- Rawlinson, P. A., 1966. Reptiles of the Victorian Mallee. Proc. Soc. Victoria, **79**, Part 2.



Figure 1. Map showing areas 1, 2, 3.



Plate 1.

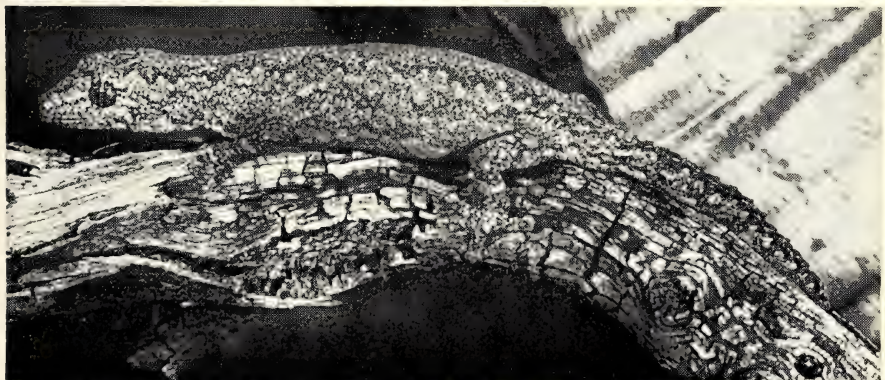
Dragon: *Physignathus gilberti*.

Plate 2. Gecko: *Diplodactylus damaeus*.

Plate 3. Dragon: *Amphibolurus fordi*.

Plate 4. Gecko: *Diplodactylus strophurus intermedius*.

Plate 5. Blind-Snake: *Typhlops australis*.



A *Diuris* Hybrid from the Melbourne Area

by

P. UHLHERR

A hybrid of *Diuris* — probably *D. longifolia* x *D. pedunculata* — was discovered by Mr. and Mrs. D. Dunn in the late Spring of 1967. It was found again in 1968 and 1969 in three separate localities of the Dandenong Ranges and the Mornington Peninsula. The author was able to study plants in the field in two of these localities during 1968 and 1969. The flowers do not conform to any species known to the author. The conclusion that a hybrid is involved is by no means certain and is based on floral characteristics and on the abundance of the two assumed parents in all the localities and the relative scarcity of the plant under discussion. Usually about 3 to 6 plants have been found in clusters among a large number of *D. longifolia*. In one area, three such clusters were found. The *D. pedunculata* was normally some hundreds of feet removed. This could possibly indicate that the latter species is the pollen donor while the former is the recipient.

The flowers of the hybrid are among the most impressive of the genus, the spreading habit of the petals giving the flowers a very large appearance. The floral characteristics are more or less intermediate between those of the supposed parents, as can be seen from Figure 1. Some variability has been observed, but not more than in *D. pedunculata* itself.

The labellum has two rather obscure basal ridges, which are slightly pubescent or glandular (to a lesser

degree than in *D. pedunculata*), as shown in Figure 2, K and L. The side lobes have irregular margins as in *D. pedunculata*, but the ratio of their length to that of the mid-lobe is much greater than is that species and agrees more nearly with the ratio found in *D. longifolia*. (Figure 1; D, E, F). The mid-lobe may be entire except for a small notch in the tip — less pronounced than in *D. longifolia* — or it may be rather irregular near its apex. This last feature is not found in either parent.

The petals are longer than in either parent, and the ratio of claw length to lamina length is very similar to that found in *D. pedunculata* (1/4 to 1/5), being somewhat less than in *D. longifolia* (1/2 to 1/3) (Figure 1: G. H. J.). The petals are almost horizontally spreading as in *D. pedunculata*. However, they do not point forwards as in that species, but rather are slightly recurved towards the ovary (Figure 1: A, B, C).

The lateral sepals are $1\frac{1}{2}$ to 2 times as long as those of either parent and are not at all petaloid. They have inrolled margins and terminate in fine points (Figure 2; M, N, O). The dorsal sepal resembles that of *D. pedunculata* in shape, but is somewhat wider and longer. It is reflexed away from the column to a greater extent than in that species. The margins near the apex may be irregularly toothed or entire, and the tip is apiculate (Figure 1; G, H, J).

The column of the hybrid resembles that of *D. longifolia* in that the wings and the anther both exceed

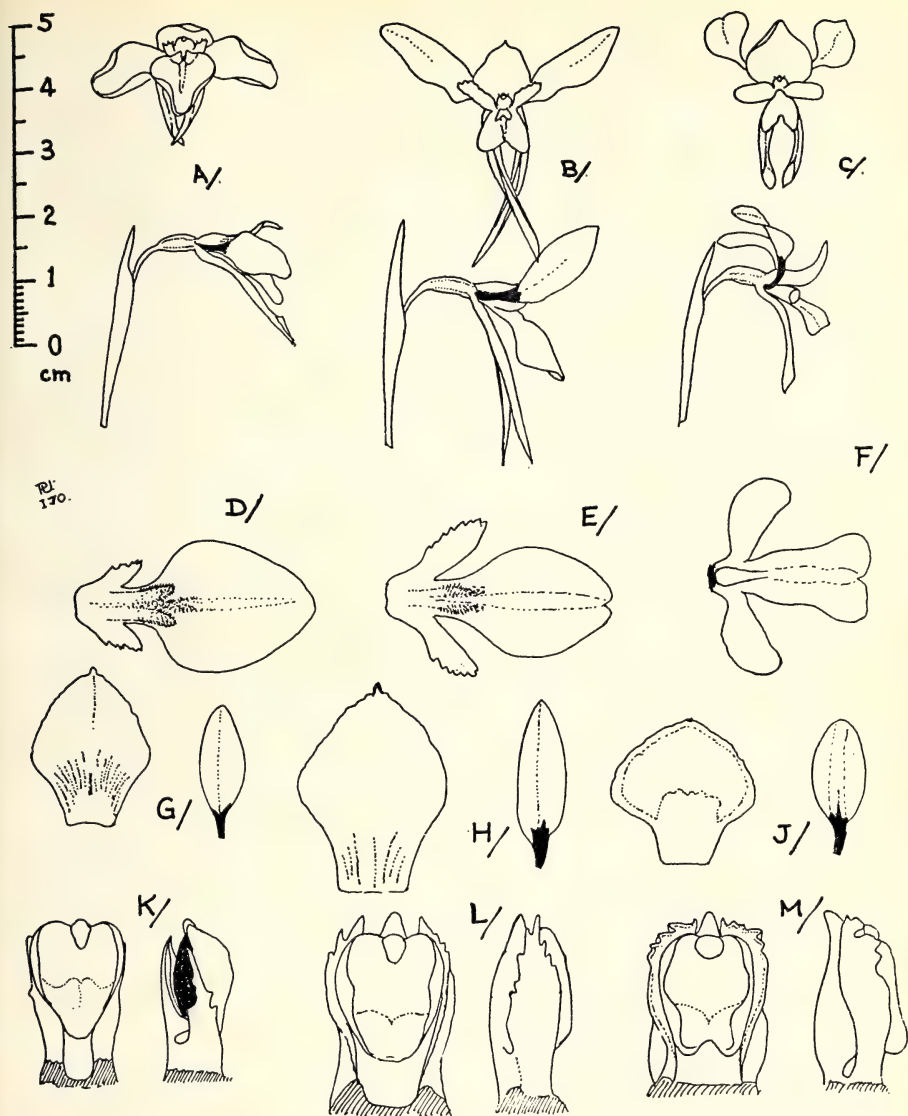


Figure 1

	<i>D. pedunculata</i> (left)	Hybrid (centre)	<i>D. longifolia</i> (right)
flower front and side (X1)	A	B	C
labellum flattened (X2)	D	E	F
dorsal sepal flattened (X2) } petal flattened (X1) }	G	H	J
column front and side (X6)	K	L	M

the rostellum in height, whereas in *D. pedunculata* both wings and anther are lower than the rostellum. However, the stigma shape is closer to that of *D. pedunculata* in that the protruding swellings at the base are lacking (Figure 1; K, L, M). The shape of the anther differs from that of both parents and is rather narrower (Figure 2; A, B, C). The pollinia, with viscidia, of the two parent species are shown in Figure 2; D, G and F, J. The pollinia of the hybrid could not be removed from the anther cap, which was rolled quite tightly around the very fragile, mealy pollen masses. The pollen was, however, easily separated from the viscid disc. This seems to indicate that perhaps the hybrid is incapable of pollination except with pollen from the parent species. The pollen of hybrid flowers certainly cannot be removed by an insect. The stigma, however, appears to be quite normal, in that it is viscid and has a tube to the ovary, which contains apparently normal ovules. The hybrid pollen masses, enclosed in the

anther cap, are shown in Figure 2; E and H.

The flower colour is yellow with a few rather pale, reddish-brown streaks or blotches. The dorsal sepal is streaked near its base, while the petals have broad but pale central streaks. The labellum mid-lobe is blotched, while the side lobes are streaked. The lateral sepals are wholly green.

Some plants were seen with flowers having a diameter of 55 mm.—considerably larger than either parent; however, most flowers measured about 40 mm. Plant height and robustness are as for *D. longifolia*. Also the underground organs resemble those of *D. longifolia*, which has a number of long, thick and fleshy roots radiating from the base of the stem. The point of attachment is constricted and extremely fragile. The rather large, more or less globular tubers of *D. pedunculata* are absent. Instead, the greatly elongated tubers are almost horizontally disposed (Figure 2; P, Q).

The flowering period is mid-October to early November.



Plate 1.

Diuris hybrid, centre; with *D. pedunculata*, left; and *D. longifolia* right.

interior of the pseudopodetia, hyphae hyaline 10 μ diam.: *Fertile pseudopodetia* similar.

Apothecia terminal on the upper branches of the fertile pseudopodetia, lecideine, 0.2-0.7 mm. diam.: *Disk* slightly concave to flat becoming strongly convex on maturity, dull reddish-brown to blackish: *Margin* slightly raised at first, disappearing: *Lower cortex* concolorous with the thallus: *Hypothecium* hyaline, obconical: *Hymenium* 50-80 μ tall, pale brownish: *Paraphyses* 1-1.5 μ diam., apical cell expanded: *Asci* 48 x 12 μ : *Ascospores* 15 x 3 μ : *Pycnidia* terminal on the smaller branches of pseudopodetia ellipsoidal 150 x 85 μ : *Pycnidiospores* hyaline 5 x 1 μ curved.

This name has been taken from an abbreviated Greek epithet, used by Rev. F. R. M. Wilson for one of his specimens and meaning "ever living coral".

Cladia ferdinandii (Mull. Arg.) R. Filson comb. nov.

Cladonia Ferdinandii Mull. Arg. in Flora 1882: p. 293.

Clathrina Ferdinandii (Mull. Arg.) Mull. Arg. in Flora 1883: p. 80.

Cladonia retipora var. *Ferdinandii* (Mull. Arg.) Wainio Acta Societatas pro Fauna et Flora Fennica IV: 234 (1887).

Cladia fuliginosa R. Filson sp. nov.
ad *C. retiporam* proxime accedens differt sic: pseudopodetiis gracilioribus, colore fusco, et praecipue medulla fuliginosa.

HOLOTYPE — Western side of Mount Campbell, Cradle Mountain-Lake St. Clair National Park, Tasmania
Rex Filson 10854 1.3.1968 (MEL 1001725).

Thallus fruticose, composed of pseudopodetia up to 7 cm. high in scattered clumps, green becoming brownish to black, smaller parts within the clump green with orange-brown tips: *Sterile pseudopodetia* rigid, horny, up to 2 mm. diam., irregularly branched, walls irregularly perforate, perforations broadly elliptic to round irregularly spaced: *Cortex* up to 80 μ thick: *Algal layer* discontinued 40-60 μ thick, cells up to 12 μ diam.: *Medulla* loosely woven filling the majority of the hollow interior of the pseudopodetia, hyphae hyaline just under the algal layer becoming brownish to black in the centre, 8-10 μ diam.: *Fertile pseudopodetia* similar.

Apothecia terminal on the upper branches of the fertile pseudopodetia, lecideine, 0.3-0.5 mm. diam.: *Disk* slightly concave to flat, reddish-brown to dark brown: *Margin* slightly raised persistent: *Lower cortex* concolorous with the thallus. *Asci* and spores not seen.

Hypogymnia billardieri (Mont.) R. Filson comb. nov.

Cetraria Billardieri Mont., Syllog Gener at Spec. Cryptog., 322 (1856).

Parmelia conferta Tayl. ex Hook, Lond. Journ. of Bot., 6: 164 (1847) —non Duby.

Parmelia Billardieri (Mont.) Zahlbr. Cat. Lich. Univ., 6: 26 (1930).

Hypogymnia subobscura (Vain) R. Filson comb. nov.

Parmelia subobscura Vain in Arkiv for Botan. 8: 33 (1909).

Hypogymnia subphysodes (Krpplbr.) R. Filson comb. nov.

Parmelia subphysodes Krpplbr. in Verhandl. zool-bot. Gesellsch. Wien 30: 338 (1880).

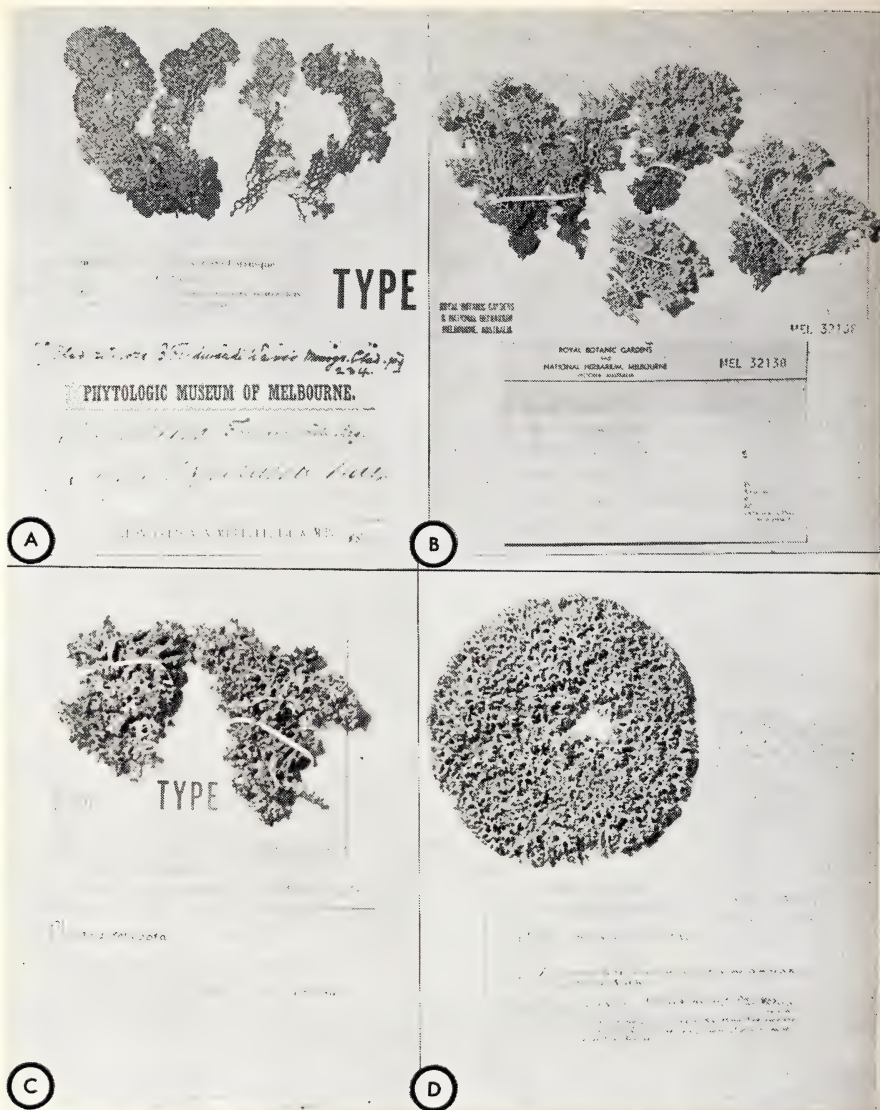


PLATE 1.

- A. Type of *Cladonia Ferdinandii* Müll. Arg. Collected near Esperance Bay, Western Australia by Andrew Dempster.
- B. Typical specimen of *Cladia ferdinandii* (Müll. Arg.) comb. nov. Collected at Aldinga Scrub, South Australia by R. W. Rogers 1171.
- C. Type of *Cladia corallaizon* sp. nov. Collected 28 miles north of Ardlethan, New South Wales by Rex Filson 5466.
- D. Typical rosette form of *Cladia corallaizon* sp. nov. Collected at The Rock, New South Wales by J. H. Willis.

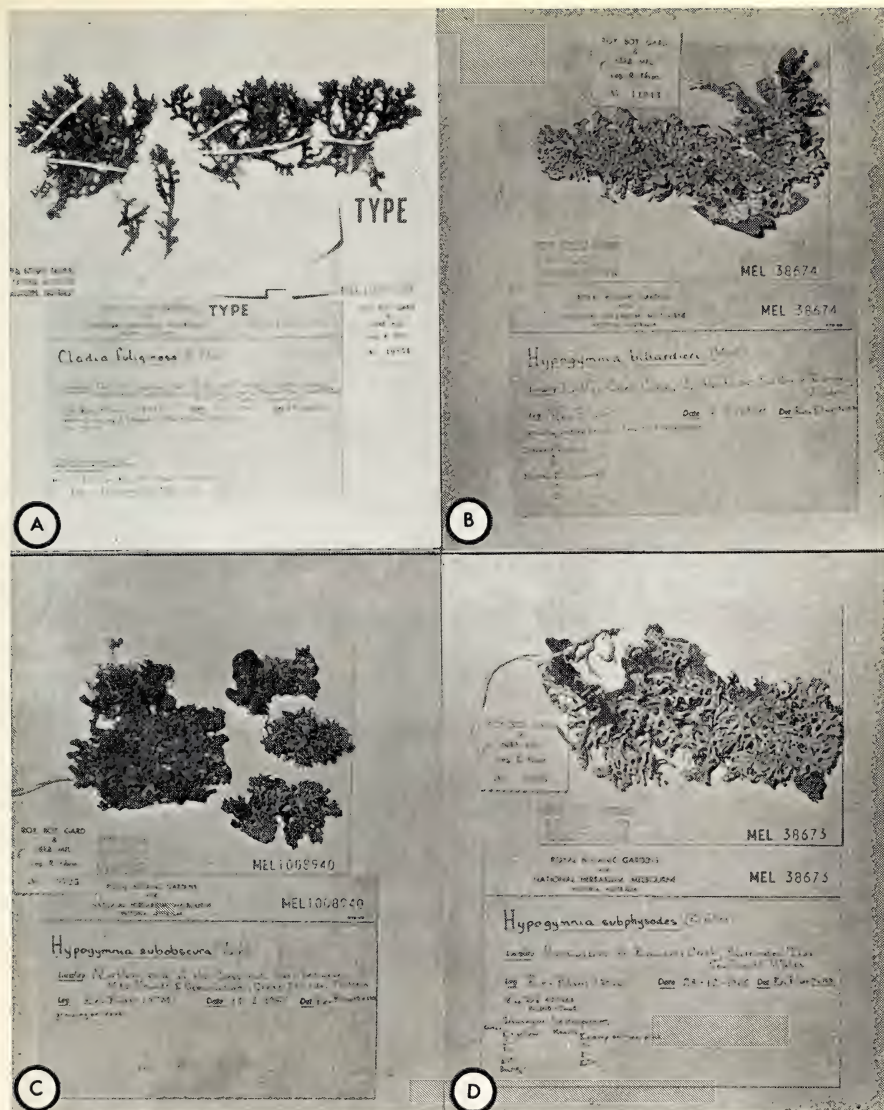


PLATE 2.

- Type of *Cladia fuliginosa* sp. nov. Collected on Mount Campbell, Tasmania by Rex Filson 10854.
- Hypogymnia billardieri* (Mont.) comb. nov.
- Hypogymnia subobscura* (Vain) comb. nov.
- Hypogymnia subphysodes* (Krpshbr.) comb. nov.

Unique Perfume *Prasophyllum fimbriatum* R Br

by DAVID L. JONES

One sunny day in March 1970 I noticed a very pleasant perfume as I entered my glasshouse. The perfume was quite strong and was easily traced to its source — a potfull of flowering plants of *Prasophyllum fimbriatum*. At a close distance the perfume was almost overpowering but still very pleasant. It was easily identifiable as lemon, being identical with the aroma from crushed leaves of Lemon-scented Gum (*Eucalyptus citriodora*) and Lemon-scented Verbena (*Verbena citriodora*).

As far as I know this perfume is unique to Australian orchids. Mr. J. H. Willis, whose olfactory powers are well known, has only noticed a faint lemon scent in *Prasophyllum odoratum*. He indicated to me that the strong lemon scent was due to the aldehydes citral and citronellal.

Perfumes are well known in the genus *Prasophyllum*, section *Euprasophyllum*; but have not been reported previously in the section *Micranthum*, although I believe *Prasophyllum striatum* to have a rather obnoxious odour. There is little doubt that the perfume is an aid to pollination and the unique nature of the odour suggests some specific insect is involved. Workers in the Sydney area should keep a watch out for this.

While the spikes were at their best I carried out a couple of small experiments to learn a bit more about the species.

In the first experiment my wife and I observed the effect of temperature on strength of the odour. It first became apparent at about 65°F and increased in intensity until at 75°F it was very strong. Once

again the release of the perfume probably coincides with the increased activity of insects at higher temperature.

The second experiment was to see if the responsible insect was active in my area at this time of the year, and conversely to see if the insects which pollinate *Prasophyllum morrisii*, *P. archeri*, and *P. despectans* are effective on *P. fimbriatum*. These insects are quite common here as all three orchid species occur naturally in the area.

I placed all of the pigmy *Prasophyllums* I had in flower in the backyard under a patch of gums. These included *P. morrisii*, *P. despectans*, *P. nublingii*, *P. fusco-viride* and *P. fimbriatum*. It was a perfect autumn day with only a light breeze and a temperature of 72°F. The lemon fragrance on the *Prasophyllum fimbriatum* was very noticeable.

The small flies were seen on all species except *P. nublingii*, but pollinia removal was only seen on *P. morrisii*. Whilst the flies visited the *P. fimbriatum*, they did not seem to be specifically attracted to it, nor did they appear to know what to do once on the spike. They seemed content to simply sit on the stem or ovary. None was seen on the labelum and none was seen to enter the flower to seek nectar. They also seemed uninterested in *P. fusco-viride*, while *P. nublingii* was ignored completely. On the other hand both *P. morrisii* and *P. despectans* were worked actively. Among other things, these results tend to indicate that the species has a rather specialized pollination relationship, which is probably related to its unique odour.

The First Golden Year at Longmeadow

by VICTOR JACOBS

Whenever the conversation turns to wattles it is not long before someone says, "Did you know that it is possible to have a wattle flowering every day of the year?" My usual answer was "Is it?", or "Have you seen it?"

They usually had not.

From the comments on the flowering seasons of the different acacias in various areas, it seemed highly likely that it was a feasible idea; and what better place to have it happen than in one's own garden. At this point I made a long range aim at Longmeadow to grow as many Victorian wattles as I could obtain, assuming that they would be suited to the habitat. At the time of writing this, in February 1970, the score is 48. This does not include certain species which lost their labels before I memorised their names, or which became muddled in the seed bed.

I began to keep records on 19 December, 1968, and one year later to the day, was able to congratulate the wattles on not missing one day of flowering. Admittedly, on some days, I had to fossick to be able to catch that golden bloom, and some of the young plants that flowered for the first time had as few as three flowers or bloomed for minute periods; but flower they did, and their immature performance holds great promise for future years. At other times the massed displays of gold, cream, or yellow, and the perfumed air were wondrous.

Figure 1 indicates the flowering species with their period of flowering.

The order used is that employed by Fred Rogers in his Field Guide to Victorian Wattles. If any reader has seeds or young plants of the missing Victorian species or sub-species or knows where to obtain either, the author would be delighted to receive this information. Appendix 2 lists the non-Victorian species growing in the garden. The un-named species numbered 7.

Failures:

Acacia enterocarpa which succumbed after being accidentally damaged, cannot be included, but *A. gracilifolia* gradually died back after flowering, until it was dead. The site may not have suited it, and I will try again. Queensland Silver or Mount Morgan Wattle (*A. podalyriaefolia*) is alive, but not growing evenly or well.

Of the wattles that flowered(*) *A. retinodes* was a very narrow leaved form; (**) *A. undulifolia* only had a half dozen heads; (***) *A. brachybotrya*, while four feet high had only three flowering heads, and (++) *A. aculeatissima* had the same.

(+) *Acacia pycnantha* has been left until last of the marked species as it is rather special. In the depths of winter when very little else was flowering the fragrant perfume was evident from all parts of the garden, and attracted one to view the massed pale display of this especially early-flowering wattle.

Is it really *Acacia pycnantha*? Or does it deserve to be given some other name? Compare the two phylloides in Plate 1. Add to this the fact

that this plant and its descendants flower not occasionally early, but consistently so, and very much earlier than the normal *A. pycnantha*. So that if we do not have a new species here, we do certainly have one that merits a place in the garden. To that end you may obtain seed from me for the cost of a stamped envelope.

Mr. G. W. Althofer, of Nindethana, Dripstone, N.S.W., has a similar early-flowering "Golden Wattle" in his lovely native garden, and this was grown from seed collected near Dimboola. Mr. Court of the National Herbarium while not advancing it to a new specific status, has informed me that a similar group of plants exist near to Serviceton.

Appendix 1. Victorian Wattles at Longmeadow (not already mentioned).

<i>A. botrycephala</i>	<i>A. dealbata.</i>	<i>A. decurrens.</i>	<i>A. oxycedrus</i>
<i>A. doratoxylon.</i>	<i>A. aneura.</i>	<i>A. acinacea.</i>	<i>A. lineata. (S)</i>
<i>A. flexifolia</i>	<i>A. leprosa. (B)</i>	<i>A. calamifolia.</i>	<i>A. brownii.</i>
<i>A. buxifolia.</i>	<i>A. myrtifolia. (B)</i>	<i>A. rubida.</i>	<i>A. hakeoides.</i>
<i>A. penninervis.</i>	<i>A. salicina.</i>	<i>A. victoriae.</i>	<i>A. vestita.</i>
<i>A. rigens. (S)</i>	<i>A. howittii</i>	<i>A. verniciflua (B)</i>	<i>A. implexa.</i>
<i>A. melanoxylon.</i>	<i>A. subporosa.</i>	<i>A. lanigera. (S)</i>	<i>A. pendula.</i>
<i>A. trineura.</i>	<i>A. dawsonei.</i>	<i>A. continua.</i>	

Appendix 2. Other wattles growing but not Victorian species.

<i>Acacia baileyana</i> —var. <i>purpurea.</i>	<i>A. becklerii (S)</i>	<i>A. brachyphylla.</i>
<i>A. cardiophylla.</i>	<i>A. cultriiformis.</i>	<i>A. cupularis.</i>
<i>A. decora.</i>	<i>A. drummondii</i>	<i>A. ericifolia.</i>
<i>A. gonophylla.</i>	<i>A. iteaphylla.</i>	<i>A. lasiocalyx.</i>
<i>A. podalyriaefolia</i>	<i>A. pratervisa.</i>	<i>A. pubescens. (S)</i>
<i>A. pruinosa.</i>	<i>A. pulchella.</i>	<i>A. spectabilis.</i>

Species.	Flowering Period.											
	DEC.	JAN.	FEB.	MAR.	APR.	MAY.	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.
<i>Acacia retinodes</i> *	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. retinodes.</i>	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. pycnantha</i> +	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. flexifolia.</i>	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. baileyana.</i>	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. pycnantha.</i>	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. boormanii.</i>	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. verticillata.</i>	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. armata.</i>	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. pravissima.</i>	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. diffusa.</i>	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. undulifolia.</i> **	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. floribunda.</i>	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. stricta.</i>	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. glandulicarpa.</i>	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. longifolia.</i>	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. aculeatissima.</i> ++	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. gracilifolia.</i>	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. mearnsii.</i>	—	—	—	—	—	—	—	—	—	—	—	—
<i>A. brachybotra.</i> ***.	—	—	—	—	—	—	—	—	—	—	—	—

*, **, ***, +, ++. See Text.

Fig. 1

The order of listing follows that used by F. J. Rogers in his **Field Guide to Victorian Wattles**. If any reader has seeds or young plants of those Victorian species not included in Appendix 1, or who knows where to obtain them, the author would be delighted to receive any information.

Plate 1

A—Phyllode of early-flowering species.

B—Phyllode of *A-pycnantha*



Plate 2

*Acacia
boormannii*

Plate 3

Early flowering species of *Acacia* ? *pycnantha*.



book reviews

AUSTRALIAN NATIVE GARDENS AND BIRDS

by

BARBARA SALTER

Jacaranda Pocket Guide Series. Milton, Jacaranda Press Pty. Ltd., 1969.

Size 4" x 5½". Price \$1.95.

Each year as more and more of the Australian bush is cleared, one wonders when the scourge of the bulldozer is going to end—before we have denuded the whole country? As the land is cleared the habitat of the wildlife is destroyed.

What can be done for conservation? The fight for National Parks and wildlife often seems hopeless. A positive action is the planting of native trees and shrubs in order to encourage the indigenous birds to the garden. A few well chosen nectar producing plants will soon attract the honeyeaters.

Many members will have visited Barbara and Arthur Salter's beautiful garden at Blackrock, and been amazed at the large number of birds that visit them. During the years 1954-68, 120 species of native birds were recorded in or over the garden.

In this book Mrs. Salter describes how to plan and establish a garden that will quickly attract the birds. She gives hints on the propagation of plants, and brief notes for the trees and shrubs which produce the

best results. Other methods of attracting birds, such as nectar feeders (a nectar recipe is included) food to be provided, and bird baths, are described.

The use of pesticides is becoming more common and widespread so that the warning and list of dangers of these chemicals to native birds is a timely inclusion in the book.

The second part of the book introduces some of the birds that have or still do frequent the Salter's garden. We thought that some of the facts were over stated, and find it hard to believe that the same pair of Blue Wrens lived in the garden for five years.

This is an interesting little book, illustrated by clear, attractive photographs taken by Arthur Salter. Perhaps we all could donate a copy to our local Superintendent of Parks and Gardens to induce him to plant more native trees and shrubs in our suburbs so that everyone will be able to enjoy our native birds.

SUE FILSON.

Flowers and Plants of Victoria in Colour

Copies of this excellent book are still available, and of course would make a wonderful gift. They are obtainable from the F.N.C.V Treasurer, Mr. D. McInnes.

A PICTORIAL ENCYCLOPAEDIA OF AUSTRALIAN WILDLIFE

by

HARRY AND CLAUDY FRAUCA

Periwinkle Colour Series. Melbourne, Lansdowne Press, 1970. Price \$1.50.
Size 7¼" x 5".

From Lansdowne come another two books in the Periwinkle Colour Series, bringing the total number of these excellent small handbooks to twenty.

The Pictorial Encyclopaedia is as its name implies, a collection of photographs with brief descriptions of a good cross section of Australian wildlife. The contents are divided into two parts; the first *invertebrates*, includes the following groups — coe-

lenterates, molluscs, insects, spiders, etc. Part two the *vertebrates* includes fishes, reptiles, birds, mammals, marsupials, etc. There is a list of further reading and the names and addresses of some scientific and natural history societies in Australia. A separate index to scientific and common names is included. This is a very useful book for beginners because it illustrates names so often encountered in articles on natural history.

GOLD PROSPECTING

by

DERRICK AND DOUG. STONE

Periwinkle Colour Series. Melbourne, Lansdowne Press, 1970. Price \$1.50.
Size 7¼" x 5".

Gold prospecting is an absorbing, and sometimes profitable, past-time. Gold has played a prominent part in the history of Australia, although the earliest record of its discovery is 1823 it was not until 1851 that gold fever seized the country. Today there are only a few mines being worked on a full-time basis, but the number of amateur prospectors has greatly increased.

With this book the task of searching for gold should be simplified. The authors explain how to easily identify gold, the forms in which

it occurs, the deposition, and the type of country in which it is found, and most important — how to work alluvial deposits. The greater part of the book contains locations and descriptions of the alluvial gold fields in each State of Australia, illustrated by coloured geological maps. The diagrams are clear, the text simple and easy to understand, with a comprehensive glossary of geological terms, but a very incomplete list of further reading.

REX AND SUE FILSON.

Botany Group

Week-end Excursion

Brilliant sunshine on Saturday and Sunday, 9 and 10 October, allowed the eight members who undertook this excursion to enjoy a superb display of springtime wildflowers, (especially the Sun-orchids), and the mild temperatures made for pleasant walking so that we were able to visit forest areas, fern gullies and hill tops where the bird calls and sightings turned the weekend into one with interests about equally divided between botany and bird observing.

The first day was chiefly occupied with the exploration of the recently declared Angahook Forest Park of 7,200 acres north-west of Airey's Inlet. Its eastern boundary is formed by the Distillery Creek which joins the Painkalac Creek to enter the ocean at the Inlet.

Our Forest Commission maps, which we obtained from the local store, stated that

... the "Eastern View Coal Measures are the predominant geological feature of the park. They comprise gravel, sand, clay and brown coal deposits laid down in the early Tertiary period. Most other Tertiary deposits in the Otways were deposited towards the close of the era ...

Small areas of Quaternary (recent) origin comprising fluviatile and swamp deposits of silt and gravel are found along Salt and Distillery Creeks."

We had our lunch near a quarry in a pleasant, Red ironbark (*E. sideroxylon*) forest, and then wandered through some heathlands where wild flowers were brilliant. The ground was dotted with Blue-stars (*Chamae-*

scilla corymbosa) and Yellow-stars (*Hypoxis*), and there were numerous species of Bush-pea, including the Showy-Parrot Pea (*Dillwynia sericea*), the Large-leaf (*Pultenaea daphnoides*), and the Dwarf Bush Pea (*Pultenaea humilis*). Clumps of white Paper Sunray (*Helipterum* sp.) were in some areas, the most showy flowers. There were several varieties of Rice Flower, the Creamy Nodding (*Pimelea octophylla*) being particularly fine; and growing close to the gold of the Leafless Globe Pea (*Sphaerolobium vimineum*) was the orange Dwarf Wedge Pea (*Gompholobium minus*) and various *Hibbertia* sp. and *Goodenias*. These colours were offset by the lavender of the Chocolate Lily (*Dichopogon strictus*) and the blue of clumps of Love Creeper (*Comesperma volubile*).

The Shining Peppermint (*E. nitida*) was the dominant Eucalypt here, but there were forests of Brown Stringybark (*E. baxteri*) and rather stunted Messmate (*E. obliqua*).

In the melaleuca swamp and gully along Distillery Creek there were many ferns, including the Rough Tree-fern, Common Maiden Hair Fern, Common Shield Fern, King Fern and large clumps of Scrambling Coral Fern, as well as the Small leafed Pomaderris (*P. elacophylla*) and Musk Daisy Bush (*Olearia argophylla*). There were clumps of Thatch Saw-Sedge (*Gahnia radula*) and quite tall specimens of the Snow Daisy Bush (*Olearia lirata*) covered

with flowers, as well as Dusty Miller (*Spyridium parvifolium*). In some areas the yellows of the Prickly-Moses (*Acacia verticillata*) and the Varnish Wattle (*Acacia verniciflua*) lined the walking tracks; and the mosquitoes were particularly numerous and vicious in these breeze-free groves!

One wallaby was sighted and the skeleton of another found by the track. We failed to reach the Currawong Falls, but certainly heard and saw many Pied Currawongs. In one area of the forest we heard singing simultaneously — two pallid cuckoos, a fantail cuckoo, and a grey thrush.

Sunday was predominantly an orchid day when we began by exploring the hills behind the Anglesea village where we found stands of the Tall Leek Orchid (*Prasophyllum elatum*) and the magnificent fully-opened dark-blue Sun Orchid (*Thelymitra grandiflora*) as well as the spotted variety (*T. ixiodes*), the Yellow (*T. flexuosa*), and the salmon (*T. rubra*). Here we also saw good specimens of Spider Orchids (*Caladenia patersonii*, *C. dilatata* with the green comb, *C. tessellata*, *C. reticulata* and *C. clavigera* (the Plain Lip Spider). These orchids grew in heathy country where the Isopogon was in flower, and where there were small bushes of *Banksia integrifolia*, and some Grass Trees (*Xanthorrhoea minor*) with flowering spikes, and areas of Running Postman (*Kennedyia prostrata*).

Later, we drove to Mogg's Creek and climbed the Ironstone Ridge immediately east of the creek. On the summit, under some Brown Stringy Bark trees, we found a patch of Mosquito Orchids (*Acianthus reniformis*) with the flowers mostly dead, and several stands of Nodding Green-

hood (*Pterostylus nutans*, *P. longifolia* and *P. barbata*). There were many bright clumps of Rabbit Ears (*Thelymitra antennifera*) and Wallflower Orchids (*Diuris longifolia*), including some pure yellow specimens. A few samples of *Glossodia major* were found, and one specimen only of a deep red Sun Orchid (*T. macmillanii?*).

In the gully further up Mogg's Creek were stands of Victorian Blue Gum (*E. globulus*) in flower, and some tall Grey Gums (*E. cypellocarpa*). This area proved to be the honey-eaters' paradise — we identified the White Eared, the Crescent, the Yellow-Winged, the Tawny-Crowned and the Brown-Headed, as well as Yellow and Scarlet Robins; Satin Fly Catcher; Rufous and Golden Whistlers; Pardalotes; Gray Fantail; White-Throated Tree Creeper, and some Red Wattle Birds.

Miss Joan Forster and Dr. Anita Rodgers made their holiday houses on the Old Coach Road available to us for cups of tea and meals, and near here we heard the Rufous Bristle Bird (which we had seen running along the road at Point Addis on the way down). We also saw an elegant pair of King Parrots and some Eastern Rosellas.

At the Allan Noble Reserve at Airey's Inlet there were some Water Hens and a couple of Mountain Duck, which we could see from our cars on the way home on Sunday afternoon.

The weekend was notable more for the variety of species and the abundance of flora, rather than for any rarities or discoveries. The two days seemed so filled with interest that it seemed to us that we had been away about a week, not just two days.

ELIZABETH TURNER.

Field Naturalists Club of Victoria

The members of the Field Naturalists Club of Victoria express their heartfelt sympathy to the husband and two young daughters of Mrs. Nancy Lewis, our Subscription Secretary. Mrs. Lewis, at the age of 36, suffered a severe brain haemorrhage on 14 October, and died on 20 October.

General Meeting

12 October, 1970

Prior to the opening of the General Meeting, an Extraordinary General Meeting was held at which a motion was put and passed unanimously approving the admittance of the Wychitella Forest Protection League as an affiliated body with the FNCV.

Approximately 70 members were present at the General Meeting which was chaired by the President, Mr. T. Sault.

The Secretary called on members to speak about their exhibits and commented that a greater use could be made of the exhibit tables and the microscopes.

Exhibits:

A. J. Swaby—A new *Grevillea* found in the Glen Wills district. A specimen of the bell-fruited mallee (*Eucalyptus preissiana*).

T. Sault—Crusader Bug (*Mictis profana*) and a "Woolly Bear" Caterpillar, a moth larva.

Mrs. G. Taylor—A spike-flowered *Acacia* (to be identified).

Shown under microscopes —

Mrs. P. Matches—Fern prothalli of the Soft Tree Fern (*Dicksonia antarctica*).

K. Strong—Foot of Bee enlarged 130 times.

D. McInnes—Pond life from Coolart Lake (Rotifers).

Mr. D. Lee displayed a specimen of the introduced pest "boneseed" (*Chrysanthemoides monilifera*) and remarked that it was spreading in the Fern Tree Gully area near the National Park. Other members had noted it at Blackburn Lake and in some private gardens.

Also tabled were Christmas cards from the National Trust Newsletter and the Natural History Medallion to be presented to Miss Jean Galbraith at the November meeting.

The Secretary read letters announcing that the Mt. Macedon Society planned to conduct a Koala Survey in their district on 22 or 29 November, the date to be decided, and members with their own transport interested in taking part should contact Mr. Lee.

The Bendigo F.N.C. in conjunction with the Bendigo J.C.'s would be holding an all-day seminar in the near future to discuss the establishment of a series of National Parks within a radius of 50 miles of their area.

The Forests Commission in conjunction with the Monash University Dept. of Zoology and Comparative Physiology would conduct a seminar on Fire Ecology at the Zoology Dept. on 28 November.

A letter was received from an interested person questioning the right of an American Paleontology Expedition to remove fossils from Lake Callabonna, S.A. for shipment to the U.S. Inquiries about this matter elicited the reply that because there were not enough qualified persons in this country to do this work, and as the Americans were world leaders in this field, it was considered that they should be allowed to carry out this important study. The U.S. experts were lent to the South Australian University to assist with the project.

It was intended to publish a locality index of the *Victorian Naturalist* from 1884-1969, compiled by Mr. Saunders of the National Parks Authority. Members agreed that it should be published and a motion was passed to this effect.

The President announced that the exhibit at the "Preparation for Retirement" show held at the Chadstone Centre had been a success due to the efforts of Mr. and Mrs. Strong.

Resignations from the positions of Vice-President and Councillor had been received from Mr. and Mrs. Strong. The Vice-Presidency had been under-

taken by Mr. J. Willis and that of Councillor, by Mr. R. Riordon, leaving one vacancy on Council yet to be filled.

Mr. T. Sault asked if any members had information regarding a proposed new road by the Country Roads Board at Turton's Track in the Otway Ranges.

A small dinner party in honour of Miss Jean Galbraith was to be held at the Botanical Hotel prior to the presentation of the Natural History Medalion on 29 November. Those wishing to attend should notify the Secretary.

The meeting was informed of the death of Mrs. Arthur Webb, a member of the club.

Mr. D. McInnes reported on the Nature Show and stated that attendances were down for this year. An application for the hire of the Lower Town Hall during Show Week had been made for next year.

The guest speaker for the evening was Dr. Malcolm Calder, Senior Lecturer in Botany at the University of Melbourne, whose subject was "The Role of the Naturalist in To-day's World". Dr. Calder's talk was topical and enlightening and presented a number of points very relevant to members. A report of the address will be published separately.

Botany Group Meeting

8 October, 1970

The speaker for the evening was Mr. Jim Willis. As usual, when the group has the privilege of hearing Mr. Willis, the numbers present were well above average. The talk was entitled "A Glimpse of Some Plants of New Guinea". Mr. Willis was there this year for the last week of June and all of July.

The area of New Guinea controlled by Australia is just twice the size of Victoria. In the 180 sq. miles of this part of New Guinea, including the S.E. Archipelago, the floral and animal life is incredible. The mountains are amazingly high and it is difficult to get to them. Now, there is a main highway through the mountains, but otherwise air travel is the only way of penetrating to the often incredibly steep mountainous parts.

There is a wide variation in rainfall in New Guinea, being only 39" around Port Moresby, where the dry hills bear a resemblance to parts of Central Aus-

tralia. But over the backbone of the Owen Stanley Ranges, the annual rainfall is 200" and the humidity 90%. There is no twilight—sunrise at 6.30 a.m., sunset at 6.30 p.m. In the Highlands the rainfall is 100-150". Mt. Hagen has a lovely climate of 60°-70°F, rain every night, but clear, fine days except for quick thunderstorms.

There is a dense population in these parts and some of the country is incredibly steep. Over population is a great problem, with terrible unemployment and no work or opportunity for intelligent people.

The flora is unbelievably rich and varied with 2,500 known orchids, 2,000 ferns, 315 grasses, 200 rhododendrons, from tiny epiphytes to those with large flowers seven inches across. At Mt. Wilhelm there are 250 species of mosses.

The beautiful birds of paradise are hard to observe as they fly about in the high jungle canopy. However, they are tame in the Baiyer River Wild Life Sanctuary, which was an excellent place for observing the fauna. Even in the towns the butterflies were amazing in size and colour, like vivid jewels. Mr. Willis met a millipede as big as an eel and as thick as a banana, which could shoot out an acrid gas when alarmed.

Beautiful pictures of the kinds and zones of vegetation were shown, the arid coastal growth at Port Moresby, the thick jungle of Lae. Lae boasts a most interesting Botanical Garden which is wonderfully grown after only 25 years. The Wahgi Valley, between Goroka and Mt. Hagen, is composed of immensely deep, rich peat.

Mt. Hagen market was shown, teeming with people and colour and dotted with the grass rotundas of the mission stalls, a bunch of apricot-coloured bananas, native fig trees with fruits growing from the trunks, a swing bridge made of vines over a rushing river. Also seen were climbing heath, a native crimson balsam, a scarlet bramble, and a huge climbing fern. Views were also shown of the moorlands, the volcano craters and cirques of Mt. Giluwe, blue mountain gentians, scarlet lichens, white heath, and up near the tundra tops, still more orchids, a quill fern, an *astelia* (*A. papuana*), and a mountain *ranunculus*. As the top of Mt. Wilhelm was approached, many plants were similar to those found on our Australian

mountains, including plenty of *Leucopogon hookeri*.

Above 10,000 ft. all the rhododendrons were scarlet and bird-pollinated, below they were insect-pollinated and mostly in shades of yellow.

After the mountain areas, we saw the north coast, including Weewak and Madang on a peninsula, and an archipelago of islands. The houses in this low, wet part are on stilts. In the

streets, the trees are covered with staghorn ferns. The *Barringtonia* tree bears its tassely flowers at night. These are followed by a quadrangular fruit.

Reluctantly the audience returned to reality and the walls of the lecture hall at the Herbarium, where Mr. Fairhall thanked Mr. Willis for a rare treat. Mr. Willis kindly answered numerous questions.

F.N.C.V. DIARY OF COMING EVENTS

GENERAL MEETINGS

Monday, 9 November — At National Herbarium, The Domain, South Yarra, commencing at 8 p.m.

1. Minutes, Reports, Announcements.
2. Nature Notes and Exhibits.
3. Subject for evening—Presentation of Natural History Medallion to Miss J. Galbraith by Mr. R. T. M. Pescott; and an address by Miss Galbraith on "The Joy of Living".
4. New Members.

OCTOBER

Ordinary: Mr. Donald R. Bray, 7 Pleasant Road, Thomastown, 3074.
Mr. Neil L. Murfet, 34 Malpas Street, East Preston, 3072. (Interest—Botany).
Miss M. A. Pertinac-Lauda, 1 Spencer Street, Essendon, 3040. (Interest—Geology.)

Joint Ordinary:

Mr. and Mrs. J. K. Barrows, 62 Heathwood Street, East Ringwood, 3135. (Interest—Natural History.)

Junior: Miss L. N. Heales, Tongala Road, Kyvalley, Vic. (Interest—Birds.)

Affiliated: Wychitella Forest Preservation League, c/o Secretary, Mr. R. Johnson, Wychitella, Vic.

Country: Mrs. Valma Lumsden, Synan Road, Fish Creek, 3959. (Interest—Botany, Birds and Conservation.)

NOVEMBER

Ordinary: Mr. Gary R. Barnes, Flat 6/6 Wattle Drive, Watsonia, 3087.
Mr. Edgar Brumer, 4 Sheridan Ave., Frankston, 3199.
Mr. Douglas N. Gunn, 35 Howard Ave., Mt. Waverley, 3149.
Mrs. L. M. Beard, 35 Jenkins St., Northcote, 3070. (Interest—Entomology.)
Mr. Harry M. Barnwell, 13 Seaview St., Mt. Waverley, 3149.

Joint Mrs. J. E. Excell and Richard Excell, 29 The Eyrie, Eaglemont, 3084.

5. General Business.
6. Correspondence.

Monday, 14 December—"Museology 70": The Function and Role of Museums in Society—Mr. J. McNally, Director of Natl. Museum of Victoria.

GROUP MEETINGS

(8 p.m. at National Herbarium unless otherwise stated)

Thursday, 12 November — Botany Group. Miss H. Aston will speak on Botanical Terms.

Wednesday, 18 November — Microscopical Group.

Friday, 27 November—Junior meeting at 8 p.m. at Hawthorn Town Hall.

Wednesday, 2 December — Geology Group.

Thursday, 3 December — Mammal Survey Group meeting at Arthur Rylah Research Centre, Brown St., Heidelberg, at 8 p.m.

Friday, 4 December — Junior meeting at 8 p.m. in Rechabite Hall, 281 High Street, Preston.

Monday, 7 December — Entomology and Marine Biology Group meeting at 8 p.m. in room next to the National Museum Theatre.

Thursday, 10 December — Botany Group: Members night.

Friday, 11 December — Montmorency and District Junior F.N.C. meeting in Scout Hall, Petrie Park at 8 p.m.

F.N.C.V. EXCURSIONS

6-8 November—Botany Group excursion to Wilson's Promontory. Details in last month's Naturalist.

Sunday, 15 November — Lorne. The coach will leave Batman Avenue at 9.30 a.m. sharp. Fare \$2.00, bring two meals.

Sunday, 6 December — Ben Cairn. The coach will leave Batman Avenue at 9.30 a.m. Fare \$1.50, bring two meals.

Sunday, 13 December — Werribee Gorge. This will be a private car excursion led by the Geology Group in conjunction with the Hawthorn Juniors Club and it is hoped other club members will join in the excursion. Cars meet at 9.30 a.m. opposite the C.T.A. Building in Flinders Street or at Bacchus Marsh at 10.30 a.m. Further details can be obtained from Mr. McInnes.

Saturday, 26 December-Sunday, 3 January — Cann River. A coach has been chartered and hotel accommodation booked for this period. The coach will remain with the party for use on day trips, the fare will be approximately \$24.00 (to be paid by the end of November, cheques to Excursion Trust) including day excursions and members will pay individually for accommodation which was quoted at \$5.50 for dinner, bed and breakfast, lunch can be obtained for 60 cents.

GEOLOGY GROUP EXCURSIONS

Sunday, 8 November — To Kinglake. Leader: Mr. George Carlos.

Sunday, 13 December — To Ingleston with Hawthorn Juniors — along Ironbark Forest Road to Pyramid Rock overlooking Werribee Gorge. Leader: Mr. J. Myers.

Sunday, 7 February — Maribyrnong River Terraces—upstream from railway bridge, Albion-Broadmeadows Line. Leader: Mr. D. McInnes.

Sunday, 14 March — To Bulla-Deep Creek Gorge. Transport by private car. Spare seats are usually available for those without their own transport. Excursions leave from the western end of Flinders Street Station, opposite the C.T.A. Building at 9.30 a.m.

No excursion is planned for January, 1971.



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Established 1880

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Microscopical: Mr. M. H. MEYER, 36 Milroy Street, East Brighton (96 3268).

Mammal Survey: Mr. P. HOMAN, 40 Howard Street, Reservoir 3073.

Entomology and Marine Biology: Mr. J. W. H. STRONG, Flat 11, "Palm Court", 1160 Dandenong Rd., Murrumbeena 3163 (56 2271).

Geology: Mr. T. SAULT.

MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available, and other activities are indicated in reports set out in the several preceding pages of this magazine.

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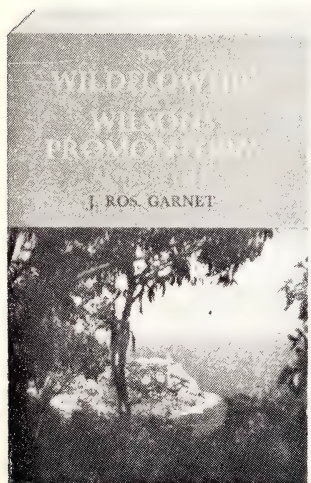
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Front Cover:

Calocephalus brownii, the "beautiful headed" bed-bush or cushion bush named after the illustrious botanist Robert Brown, who did some of his important collecting in the Kent Group. Here it is being put to good use!

Photo: Julie Marginson.

South West Island, and other investigations in the Kent Group

by

JACK JONES,* M. A. MARGINSON†

AND S. MURRAY-SMITH†

Thanks to oil and natural gas, Bass Strait is now a familiar phrase on the financial pages of our newspapers. Indeed, the States have been quarreling as to just where their previously unregarded offshore boundaries in Bass Strait lie. Accompanying this awakening of stock exchange interest in recent years has been the development of an interest in the history, geography and ecology of the scores of islands and some thousands of Australians in this region.

Until the last ten years very little systematic scientific work had been carried out in the Bass Strait islands. Individuals as well as groups of amateur naturalists occasionally made enterprising expeditions, however, and the literature, though of course discursive, is of surprising volume and goes back almost as far as the founding of Sydney Cove.¹ It is of interest that the first settlement in Australia outside the Sydney area was that of Captain Charles Bishop in Kent Bay, on Cape Barren Island, in October 1798,² while the fur seals which Bishop was seeking provided — together with the whales such men soon turned their attention to — probably the bulk of Australia's export income in the first forty years of this nation's existence.³ One follows Geoffrey Blainey in wondering whether the general lack of interest in Bass Strait, which has prevailed until recently and is still apparent, is not due to the general apathy of Australians to the maritime history

which has been so important to them.⁴

In contrast to the earlier period, however, in the last decade a significant beginning has been made to the scientific assessment of the region. In no small part this has been due to the establishment at Monash University, initially under Professor "Jock" Marshall, of a zoology department unfashionable enough to be unashamedly interested in Australian studies. It would be tedious to list the contributions made in recent years to the study of Bass Strait, but mention may be made in passing to Norman Tindale's remarkable paper on the Cape Barren Islanders, *Growth of a People (Records of the Queen Victoria Museum, Launceston, n.s. No. 2, 1952)*; to Robin J. Pryor's papers on land use on Flinders Island; to the Royal Society of Victoria's publications on the amphibia (M. J. Littlejohn and A. A. Martin), reptilia (P. A. Rawlinson) and fishes (R. S. Frankenberg) of the islands; to Dom. Serventy's famous papers on the mutton-bird; to E. R. Guiler's and D. F. Dorward's work on the Cape Barren goose; to R. A. Keble's and J. N. Jennings' publications on the sun-lands of Bass Strait; to R. H. Green's work on the birds of Flinders Island (1969); to R. C. Kershaw's and F. L. Sutherland's unpublished manuscript on the geological history of Flinders Island (1967); and to Jeannette Hope's synoptic study of the mammals of Bass Strait (Ph. D. thesis, Monash University, 1969). In

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†University of Melbourne.

the historical area N. J. B. Plomley's classic edition of the G. A. Robinson papers, *Friendly Mission* (Tasmanian Historical Research Association, 1966), is too little known, and it is understood that a professional history of King Island has recently been commissioned.

Of great promise is the rapidly developing concern of the Australian Conservation Foundation in the Bass Strait area, with an early intensive field-study of the Furneaux Group projected, and beyond that the possibility of a major, comprehensive survey of the eastern Bass Strait islands in general. It is also pleasing to record the investigation of the Hogan Group in 1968 by a properly-mounted expedition of young scientists, under the auspices of the McCoy Society of Melbourne; publication of the results is well advanced. Plans for a similar expedition to Curtis Island in 1971 are now under way.

Background to the present study

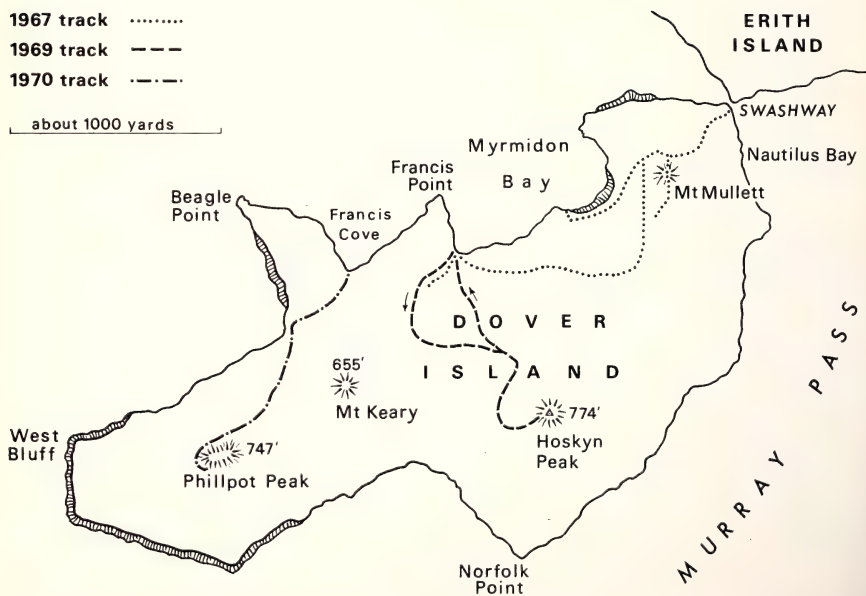
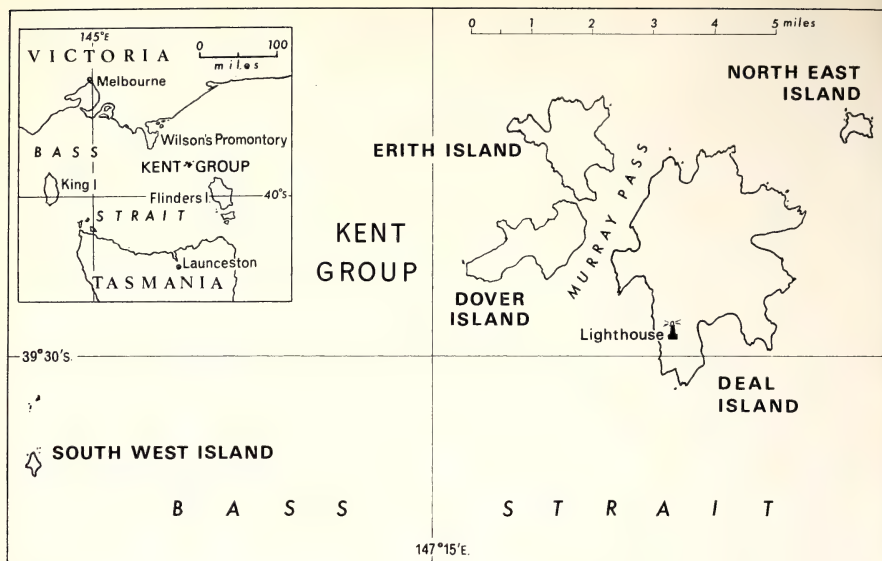
For nearly ten years a party, of which the present authors are members, has been visiting the Kent Group in Bass Strait. We have been based (by courtesy of Mr. Brian Stackhouse) on Erith Island, have normally spent three to five weeks on each visit, and have attempted, within the limitations of our amateur status, to open up areas for future systematic investigation by those more qualified. Of the present authors the first is an amateur naturalist and ornithologist of long standing, the second a biochemist and the third a historian. Records of our previous expeditions and their findings, together with historical and other background for the Kent Group, will be found in previous articles in the *Victorian Naturalist*

for August 1967 and September 1969.

The Kent Group lies about forty miles south-east of Wilsons Promontory and approximately equidistant between the Victorian mainland and Flinders Island. It consists of three large islands, Deal, Erith and Dover, contiguous with each other, and two smaller islands some distance away, North East and South West. Deal Island, the largest in the Group, is about 5,000 acres in extent and rises to one thousand feet. With two light-house families, it is the only inhabited island in the Group.

The interest of the Group resides in several factors. One is that it is not only a substantial body of land, but lies at what might be called Bass Strait's "pole of inaccessibility", thus giving it a special biological significance. Another is the range of habitat or land-use: Deal Island, continuously occupied since 1846, with only vestigial grazing now taking place on it, and with a varied cover of grassland, shrubland and woodland; Erith Island, held under a grazing lease and running some forty cattle; Dover Island, impossibly precipitous and heavily wooded, and seemingly never disturbed by the hand of man; the two smallest islands, also untouched but in this case mounting only stunted or ground-hugging vegetation. A third interest is the physical beauty, variety and grandeur of these islands.

The reason we go to the Kent Group is not primarily to undertake scientific work. It is to get away from people and the insanities of the "growth" complex ruining what we suppose has to be called "civilized" Australia; to have time to talk and drink and quarrel and to get to know even our children and our close friends better; to hear the sea and feel the wind and see the cliffs and



the colour of the water. But we also believe that a focus of endeavour at some point makes any undertaking more enjoyable. In our 1969-70 visit we had four major enterprises in mind: a long overdue census by a trained observer of the bird life of the islands; an attempt to take our explorations of Dover Island further by penetrating the south-western end of the island; a landing on, and survey of, South West Island, the least-visited and most remote island in the Group; and the recording of wind and weather. An account of the carrying out of these tasks follows.*

SOUTH WEST ISLAND

For years we had been looking towards the fifth island of the Kent Group, South West. We had seen it in the distance from the *Marjorie Phyllis*, we had seen it glistening in the sunset as we stood on the high peaks of Deal, we had seen it closer still in climbing Phillpot Peak on Dover this year. The strange pattern of dark and light greens over the plateau top of South West had become a source of lively discussion. And we had seen the island as we bent double into the wind at One Tree Hill on Erith on the day following a storm such as we would not willingly be in again. Spray was still being hurled almost to the top of its 250 feet cliffs in a scene of such wildness that for the first time, we were forced to visualize New Zealand



South West Island, aerial photo 1964, scale 1,070 ft. to the inch. (a) Trig. point, 323 feet. (b) Tarn. (c) Landing point. The long axis of the island is close to north-south.

to the East and South America to the West as the only windbreaks at 40° South. The "wind rose" for Erith which accompanies this article shows better than words the windiness of the area; but, as the islands are protected from tourist exploitation by the winds, we have never really resented them.

South West is about seven and a half statute miles from the nearest point of the Kent Group. It has the general shape of an elongated pie, with a plateau (sloping to the east) atop 250 foot cliffs and with some undulations in the plateau leading to a rise of 323 feet above sea level. On this eminence there is a massive trig. point, visible with binoculars from Erith Island, and reputedly placed there during the Second

*We wish to acknowledge with gratitude the assistance and support of Mr. Brian Stackhouse, of Flinders Island; of Mr. Frank Goold, of Port Albert; of Mr. and Mrs. Jack Lierich, of Port Welshpool; of Mr. and Mrs. Bob McNeill and Mr. and Mrs. Clive Cocum, of Deal Island; of Captain H. M. Head, Regional Director of the Department of Shipping and Transport, Melbourne; of Dr. F. A. Berson, of the CSIRO Division of Meteorological Physics, Aspendale, Victoria; and of Comalco Industries Pty. Ltd. who, through the good offices of Mr. Dean Bunney, supplied us with an aluminium dinghy which was ideal for our purposes.

World War as a navigational aid to ships avoiding minefields off Wilson's Promontory. We were informed by Mr. Frank Goold that a couple of brief landings have been made on the island since that time by passing yachtsmen, but there is no record of this, and certainly no collections exist from South West Island.

All this then made a splendid lure, and we were able to arrange that, on 17 January, 1970, during a few hours respite from his almost unbelievably heavy schedule, Frank Goold should take a party of us there. It seemed fair weather in our sheltered cove but by the time we were well into Murray Pass it had become clear that we were heading into considerable seas. Seas "slight"

to "moderate" from the south-west and rising, encountered by a 48 foot fishing boat heading south-west, is enough description for the initiated; the uninitiated are advised not to believe those words at all. We quickly found that to hang on tight enough to avoid falling over required all our strength. In the interests of science it ought to be recorded here that twenty-four hard-boiled eggs roll around the open deck of a fishing boat with great vectorial originality. As an example of human resource it ought also to be recorded that we did not lose an egg, since they were scrambled after expertly by some of the party. Others were nearly lost overboard, helpless with laughter at this grotesque egg ballet.

There seemed to be little hope of landing on South West in such conditions, but Frank Goold was of the opinion that there might prove to be a small lee under the cliffs on the north-east of the island. As we came closer, the trig. point stood out clearly and the patterns of vegetation became much more obvious—many different shades of green over the plateau, now quite clearly deriving from relatively homogeneous patches of different plants. There also appeared to be a cleft in the cliffs right ahead of us; we now seemed in these rough seas to be heading for a collision with the island. At the last moment the *Marjorie Phyllis* slid out of the waves and into the predicted lee. The cleft was now seen as a very steep gully in the centre of the calm area. We unshipped our dinghy and a landing was effected with some difficulty by an advance party on to large slippery granite boulders which were being subjected to a three foot lee swell. (Eventually the whole party managed to land, including much to our surprise the small children.)



South West Island—the landing point with the dinghy in foreground, and *Marjorie Phyllis* at anchor. The severity of the gully slope is not evident in this photograph.

Photo: M. A. Marginson.

It was an extremely exciting moment. We had landed at the foot of a gully some fifty to a hundred feet wide which rose at a severe angle for some two hundred feet as a mass of granite debris of varying sizes. The whole mass was covered with succulent plants from the high-water mark up—literally held together by the Rounded Noon-flower (*Disphyma australe*). The granite around us was of a different type to that seen on the other islands: it did not appear to be exfoliating, and contained large books of glistening mica and white and grey-green crystals.

We commenced to climb the gully with considerable caution, testing every footstep and being careful to avoid dislodging rocks on to those below. For the first hundred or so feet there was no evidence of any other vegetation but the noon-flower. At about 150 feet a large outcrop of the Tree Hollyhock (*Lavatera arborea*) was discovered growing profusely, even rankly, in the gully and up one side of it. Its very pale lilac flowers with their deep lilac stripes and its grey-green leaves formed a striking contrast to the carpet of apple-green, brown and red noon-flower leaves. The cliffs at the top of the gully now became almost sheer and the gully debouched to the right and led around to the summit plateau. In this area patches of Blue Tussock-grass (*Poa poiformis*) began to appear amidst the noon-flower, and isolated specimens of the Bulbine Lily (*Bulbine bulbosa*), the Variable Groundsel (*Senecio lautus* subsp. *dissectifolius*) and Sea-berry Saltbush (*Rhagodia baccata*) were noted.

On reaching the summit it was seen that there were several elevated points in different directions, with a main eminence to the north west.

It immediately became apparent that the vegetation was highly regionalized, and a careful study of the location of each species would, we are sure, prove most rewarding to a botanist.

The following notes are very rough and mostly serve to indicate the phenomenon rather than to give details of it. From our access gully we set out across the middle of the island on a carpet of noon-flower flanked by tussock grass domains. The tussock grass was honey-combed with burrows—whether of mutton bird or of penguin we were uncertain until we found a mutton bird chick and a penguin in the same area. Do the penguins inhabit the mutton bird burrows in the latter's absence? It seemed that the type of cover was related to the depth of the soil and the degree of exposure. The noon-flower grew typically on large areas of smooth granite, the tussock grass where the ground was more broken and the soil deeper.

Led across the island by the noon-flower carpet, and then through the tussock grass, we suddenly came across an outstanding feature of South West. Almost in its middle, there is a large, well-established depression, perhaps 50 feet wide by 100 feet long, in which was contained a quantity of very salty water. This was far from being a mere rock pool. It was a little lake or tarn with a bottom of fine granite and quartz pebbles, some of which had an unusual green coloration. There was a distinct shore-line and a fine pebbly strand. These pebbles in and around the tarn were composed of crushed pegmatite quartz, with some alkali feldspar and traces of mica, the green stain being possibly due to the effect of copper compounds. Large crystals of mica of a Muscovite type found elsewhere on the island, an

inch or more in length, also indicate the pegmatitic origin of the island's granite, and were also stained with a green smear typical of such an association.

The shore-line vegetation around the pool was quite consolidated, forming a distinct ledge a foot or more high which fringed the pebbly "beach". This consisted of a mass of succulents — Noon-flower, Austral Stonecrop (*Crassula sieberana*) and Beaded Glasswort (*Salicornia quinqueflora*) — with here and there a tussock of *Poa*. It was obvious that the tarn fills up periodically, since the pan was but half covered and there was a clear spillway to a great chasm nearby in the western cliff line.

On investigating this chasm, we found a carpet of noon-flower even more remarkable than the one we had climbed up. Here the plant was cascading over the cliff's edge and growing down as far as we could see on nearly sheer walls of granite. (This phenomenon was seen again on the cliffs beyond the main peak and short of the north point.) Leav-

ing the tarn, we now climbed up to the trig. point, first through tussock grass honeycombed with burrows, and then through tumbled boulders between which grew dwarfed specimens of many of the plants with which we were familiar on the other islands—notably the Sea Box (*Alyxia buxifolia*), the Variable Groundsel, the Seaberry Saltbush and a *Correa*, among others. The *Correa* we assumed to be a white-flowering variety of our familiar *C. reflexa* var. *nummularifolia*, but specimens of it were later positively identified at the National Herbarium as *C. alba*, a species new to the records of the Kent Group. None of the familiar plants looked quite the same as we had seen them elsewhere in the Group and we were a little puzzled by them at first. None was higher than three feet and they seemed oddly different — distorted by the hard conditions.

What was familiar, however, was the presence of lichen everywhere—the typical orange lichens of these islands being seen together with yellow and green types. The trig. point (which we found to be some-

The tarn on the plateau of South West Island.

Photo:
M. A. Marginson.



what dilapidated) was covered in frilly green lichen, particularly on its lee side. (A list of eight lichens collected is given in an appendix.)

Heading now towards the north point of the island we descended from the slight elevation of the main peak, with another spectacular noon-flower chasm showing up on the west side, and so down to another carpet of succulents. This was the most extensive area of the island under succulent cover, being almost as wide as the island at this point and composed almost exclusively of Rounded Noon-flower with some lesser elements of Austral Stonecrop and Beaded Glasswort. Once again we saw no sign of the Angled Noon-flower (*Carpobrotus rossii*) — this succulent, though a minor component, was always found in the succulent areas of Erith Island. When in full bloom such a great stretch of succulents must be a rare sight.

As the ground rose again to the north point the regional nature of the other vegetation was again seen. The exposed area of granite with succulent cover gave place on the rise to what is best described as being basically an area of tussock grass. The grass itself was everywhere interlaced with a scattering of the three persistent succulent species which had been noted at the tarn, as well as the Bower Spinach (*Tetragonia implexicoma*). These species seemed to form a substratum to all the flora, sometimes in a very minor role, as here, and sometimes being quite dominant, as on the granite slopes. Large areas of the tussock grass domain, however, appeared to have been successfully invaded by other plants. In this area, the plants which had been most successful in forming colonies were the Tree Hollyhock (*Lavatera arborea*) and the Coast Saltbush (*Atriplex cinerea*). In fact,

substantial areas of this northern part of the island were under a dense cover of two to three foot high bushes of these two species. This was responsible for the green patches on the north point which had been discerned from a distance.

Close by the north point, and overlooking the western side of the island, we found two rough stone shelters, adjacent to one another, made by walling in a large space under an overhanging rock.

While this investigation had been proceeding, other members of the party pursued their own interests, whether enjoying the glorious isolation of the island, observing the bird life or making more meticulous observations of smaller areas. One such point of study was the area sloping away from the lake to the south east. As on the north point, there had been seen, from a distance, prominent areas of differing greens. Set, as in the north, in a domain of bird-burrowed tussock grass with a substratum of succulents, it was found that, as the slope fell away to the cliffs, there was firstly a substantial area in which the tussock grass was replaced by bushes between one to three feet in height, composed largely of the Variable Groundsel and of the Seaberry Saltbush. As the plateau sloped away to the south, and quite suddenly, these plants were replaced by a relatively homogeneous area of Tree Hollyhock. (The vertical fall of the whole slope would have been something like fifty feet.) Scattered through these patches, but growing no more than twelve inches high, were the Bulbine Lily and the Austral Storksbill (*Pelargonium australe*). Although this is the first time we have mentioned this pelargonium, it was in fact scattered through the mixed tussock grass areas, its twisted semi-prostrate stems being something

of a feature of the ground cover. Other species collected here and there on the plateau were the Coast Peppergrass (*Lepidium foliosum*) and the Tall Daisy (*Brachycome diversifolia* var. *maritima*).

As we came to leave the island we began to summarize some of the features of it which were most notable. Firstly we were struck by the differences between this island and the other islands of the Group. The very granite of the island looked (and was) different to that of the other islands. The plants grew in domains in a way which we had not seen before. Common plants, such as the Seaberry Saltbush, were existing in such hard conditions that they had grown in an unfamiliar and distorted way. Plants which were quite common on the exposed parts of the other islands (excepting North East) were not found here at all: for instance, the Oyster Bay Pine (*Callitris rhomboidea*), Grass Triggerplant (*Stylidium graminifolium*), Hop Goodenia (*Goodenia ovata*), casuarina, and most noticeably the Cushion Bush (*Calocephalus brownii*). In addition, there were several plants on this island (Coast Saltbush, Tree Hollyhock and Austral Storksbill) which we had not collected elsewhere, even on the not dissimilar North East Island, and which must be inconspicuous if they do occur elsewhere. On this island they were dominant species. All these differences gave us the impression that South West did not truly belong to the Kent Group.

The second feature which we recognized was that, even in the short time available, we had traversed the island with ease almost from end to end, leaving only the southwest point unexplored. Yet from a distance the island appears a considerable mass. The answer to the

contradiction lies in the fact that, by contrast with the other islands, we were dealing with a plateau which, once attained, gave easy access to all its parts. It should be noted, however, that there were some precipitous cliffy areas we did not have time to prospect, and on which some flowering plants which interested us were to be seen.

Leaving the plateau and the island proved almost as difficult as attaining them. Descending the gully which appears the only feasible landing place on the island a large boulder was dislodged, to the peril of those below. The swell on the rocks where we had landed would have made re-embarkation most difficult, but fortunately by this time something of a natural landing stage had been discovered a few yards to the south of the gully's mouth, accessible from the land by a climb above a deep cleft in the rocks. We were thankful when the whole party had been successfully transferred from rocks to dinghy and from dinghy to the ketch.

As we left the lee of South West, we found that the seas had not been idle while we explored, and we scudded home in front of a mild gale, surfing on waves astern which showed how much the sea had got up. In next to no time we were back in our sheltered cove on Erith, but full of determination that next time we would have a longer stay on this island of differences.

ASCENT OF PHILLPOT PEAK, DOVER ISLAND

George Phillpot was a young seaman, a ship's boy in fact, who died aboard the Royal Navy's survey vessel *Myrmidon* on 23 December 1886, and is buried above West Cove on Erith Island. The solid cross erected above his grave by his shipmates is



South West Island from the east. The landing point was the conspicuous gully slightly left of centre.

Photo: M. A. Marginson.

still a constant source of interest to visitors and the children of our party. The second highest peak on Dover Island, 747 feet in height according to the survey of his own colleagues, has been named after him.

The vicinity of Phillpot Peak has always appeared to us the most inaccessible part on Dover Island, mainly because our own investigations over the years have gradually worked down the island in a south-westerly direction from the swashway, the point at which Dover Island touches Erith Island. It is the fourth prominence of Dover Island, working in this direction, and commands the approach to the top of the imposing precipices of West Bluff, some five hundred feet in height. We have found that it is virtually impossible, for a party of our character, to work down the ridge of Dover Island. Thus in 1966-7 we investigated the area around Mount Mullett, at the north-east end of the island, climbing directly up from the swashway. In 1968-9 we portaged our boat

through the swashway, landed in Myrmidon Bay, and climbed directly up to the highest point of the island, Hoskyn Peak (774 feet). At that time we reconnoitred a further possible landing point in what we call Francis Cove, between Francis Point and Beagle Point on the exposed western side of the island, which we hoped would give access to the toe of the island. This prognosis proved correct.

On 16 January 1970, a beautiful day with some haze obscuring the islands far out to sea, we left our quarters on West Cove at 10.30 a.m. (T.S.T.) with a fully-loaded dinghy containing seven members of the party. Portaging across the swashway, and motoring around the north-west cliffs of Dover, we landed fairly easily on the large, slippery granite boulders of Francis Cove, just one hour after leaving home. We carried our dinghy well up above high water mark and revelled to find here, fringing the tumbled rocks of the shoreline, a splendid springy carpet of mesembryanthemum amid

the tussock-grass, just right for changing into climbing clothes and (on our return) lunching and reclining after our ascent. In this vicinity were also many flourishing examples of the Cushion-bush (*Calocephalus brownii*), which were later also put to good use.

The first stage of our climb was simple: through the tussock-grass and, in only a few minutes, to the top of the ridge overlooking Francis Cove. Here we found ourselves on the neck of the peninsula which runs out to Beagle Point, and already commanding a magnificent prospect: to the south-west the great cliffs running round to West Bluff; straight down, through a cleft in the cliff on which we stood, to a seal playing in the surge over the rocks; to our north, some fine stands of casuarina on the Beagle peninsula. Just where we were standing the rocks were spectacularly daubed with a lichen like splashes of vivid red ochre. The vegetation here comprised

some of the largest clumps of the Grass Triggerplant (*Stylidium graminifolium*) that we have seen anywhere, together with the Round-leaved Correa (*C. reflexa* var. *nummulariifolia*), the Crimson-berry (*Cyathodes juniperina*), the Coast Swainson-pea (*Swainsona lessertiiifolia*), the Common Fringe-Myrtle (*Calytrix tetragona*), the Tall Daisy (*Brachycome diversifolia* var. *maritima*) and the Sea Box (*Alyxia buxifolia*). The Hop Goodenia (*G. ovata*) was, as elsewhere on Dover Island, present, as were two rushes, a Club-rush and the Sea Rush (*Juncus maritimus*). The whole was dispersed amid the *Poa* grass.

So far we had only been ascending the glacis of the island: now came the real defences though, to our surprise, they proved far more negotiable than the formidable groves we had met further to the north in previous years. The same Coast Tea-Tree was here, in thick interlaced groves, so that initially we decided to try to



Landing Beach, Francis Cove, Dover Island. Erith Island is in distance.

Photo: Julie Marginson.



A typical "washaway" or shallow erosion gully above Francis Cove, Dover Island.

Photo: M. A. Marginson.

climb gingerly around the edges of the cliffs. We soon found, however, that the tea-tree was more stunted and dispersed than we had found on the slopes of Hoskyn Peak, and did not form the climax forest that we had struggled through there. Our progress was aided by the fact that it was shot through at many points by open patches and washaways, often sprinkled with small quartz, or larger granite, pebbles. These washaways, which we can only assume are periodic watercourses, are a distinctive feature of this section of Dover Island, and the only evidence we have seen on the island that would point to a lack of physical stability.

After some initial difficulties we pushed our way fairly rapidly through the scrub, noting the frequent bushes of red correa flowering profusely, as was the Manuka (*Leptospermum scoparium*) from about three hun-

dred feet. We also collected specimens of the Slender Rice-flower (*Pimelea linifolia*), the Bulbine Lily (*Bulbine bulbosa*), the Variable Groundsel (*Senecio lautus* subsp. *dissectifolius*), the Common Heath (*Epacris impressa*), the Coast Boobialla, and of mosses and fungi met with from about 450 feet. At about this level we came across dwarf casuarinas and our first eucalypts, three or four trees, semi-prostrate and five to six feet high, existing as an island community in a sheltered gully, and surrounded by thick tea-tree.

Phillpot Peak now looked close, and granite outcrops were occurring to mitigate the trials of the increasingly steep rise. What we were looking at, however, was a false crest, and a long and rough scramble was still ahead of us. As soon as we moved over into any lee we found, as we had on previous

trips, that the vegetation can suddenly spring up profusely to ten feet or more in height. This was particularly so with the robust Oyster Bay Pines (*Callitris rhomboidea*), which we had first met with at about 350 feet, and the gums (Shining Peppermints, *E. nitida*) now becoming an important part of the cover.* Finally, after some high-stepping over and around weathered granite outcrops, we came on a sloping rock face which gave us access to the peak, some two hours after we had left the shoreline. So far as we know ours was the first ascent.

The view to the east, across the southern mouth of Murray Pass to the highest cliffs of Deal Island, was magnificent. So too was the southern aspect out to South West Island, some eight miles away, a tantalising prospect, for we were then uncertain whether we should be able to reach it. The outlook that held our attention most firmly, however, was that immediately below us and out to the West Bluff of Dover Island, the utmost inaccessibility, which we still hope one day to reach. A great shallow gully, perhaps half a mile wide and open to the west, sloped away beneath us, choked with thick growth. To our left the main ridge of the island continued beyond Phillipot Peak to the heights of West Bluff. Far away, above the precipices of West Bluff, we could see tall eucalypts standing out above the lower scrub: an unusual and an enticing sight. It seems likely that a practicable route lies along the ridge to those gums.

Around the peak, on which we

built a cairn, the vegetation was thick and three to four feet high, with eucalypts up to five feet. Apart from these we distinguished a mixed cover of Crimson-berry, Manuka, Coast Tea-Tree, Oyster Bay Pine and dwarf casuarina. Many dead branches strewn the ground indicated the force of the prevailing winds from the west but, for all that, we got the impression that West Bluff protects this peak from the worst of the weather.

In the general area of, and somewhat below the peak, we collected specimens of the Variable Sallow Wattle (*Acacia mucronata*), the Large-leaf Bush-pea (*Pultenaea daphnoides*), the Common Aotus (*Aotus ericoides*) and the Dusty Daisy-Bush (*Olearia phlogopappa*).

After a leisurely and pleasant sojourn on our west-facing rock face near the peak we descended rapidly, in fifty minutes, to the shoreline at Francis Cove, experiencing only a few tangles in the tea-tree thickets about two-thirds of the way back, but pausing again to inspect the distinctive erosion pattern which interested us so much. On the whole trip we saw no snakes (though the White-lipped is found on Dover) and no animals, although the Brush-tailed Possum is present on Dover as well as elsewhere in the Kent Group, and may be a distinct (and smaller) variety of the Tasmanian subspecies found on King and Flinders Islands.⁵ Further, Dover Island, for some strange reason, appears to be relatively lacking in bird life.

This expedition, though not as difficult an operation as at first we had feared, was a useful extension of our investigations of Dover Island, which may now be said to have been "sampled" at both extremities and in the middle. We feel we have

*We assume that the gums mentioned in the previous paragraph are of this species. This identification, made from fruits collected, presumably disposes of the tentative identification of Dover Island eucalypts discovered on our previous trip as *E. viminalis* (see *Vic. Nat.*, Vol. 86, No. 9, September 1969, pp. 259 and 268).

established that, within the confines of that relatively small island, there is an interesting range of plant adaptations to topography, and that an infinity of specialised studies on this virgin island is possible, so long as it remains inviolate and unharmed.

Our outing concluded with a plea-

sant, leisurely trip back close under the cliffs of Myrmidon Bay; since the tide was up, a less arduous portage across the swashway, and a few anxious moments as our deep-laden boat hit some heavy swells as we came around the headland into West Cove.

* * *

THE BIRDS OF THE KENT GROUP*

In extensive wandering, some at night, throughout a nine-day visit to the Kent Group in January 1970 I identified twenty-six native species of birds (twenty-one positively, five tentatively) and five non-native European species.

Other records and information indicate the number of reported native species to be about sixty-seven for Kent Group birds. More investigation is required, particularly of land species, as present-day occurrence of various of the species is uncertain.

During my period on these islands the weather was mainly fine, but with strong winds at times. Most of

the period was spent on Erith Island, with about twelve hours in four visits to Dover Island, about eight hours in the field on Deal Island, and two hours on South West Island. North East Island was not visited.

Apart from the strong impression I experienced of being on a sea-girt group of small islands, with spectacular coastal landscapes, my attention was most affected by the sparse occurrence of birds in species and individuals, whether in scrub and forest, open downs, sandy beach, rocky coast or seaward. I had

*This section of this article is contributed by Jack Jones and is related in the first person.



Panorama of Dover Island, January 1970, from Erith Island, Phillpot Peak, the ascent of which is described in this article, is the highest prominence above the cliffs to the right. The landing point in Francis Cove is below Phillpot Peak in this picture.

Photo: M. A. Marginson.

expected that the birds of the Group would be numerous about the coasts and beaches, and that interesting, perhaps exciting, rediscoveries might be made in grasslands, scrub and forest. However, my finding supports those of S. A. White (1909) and A. H. E. Mattingley (1938) that bird life on the islands is not numerous.⁶ Indeed, it may have considerably declined during the course of this century, perhaps as the result of the burning of grasslands and scrub for grazing purposes on Deal Island throughout the period, and on Erith Island since the early 1950's at least.

Apart from grasslands, which are not present on Dover Island, there is probably no essential difference between the three major islands as far as the likely occurrence of

species is concerned. North East and South West Islands, however, which are small, outlying, craggy islands, together present a separate ornithological experience, for here we find a considerable breeding of several species of pelagic birds. This should have close attention at intervals throughout the season, with observers present for several days at a time, because there are few published records, all of which resulted from daytime visits of a few hours each.

Birds observed

The list names the thirty-one species identified by me, including five tentatively, and the islands where seen (but I am not asserting that any of the species does not occur on islands where no sightings were made).

Native Species	Erith Is.	Dover Is.	Deal Is.	South West Is.
Fairy Penguin, <i>Eudyptula minor</i> (a)	X	—	—	X
Short-tailed Shearwater, <i>Puffinus tenuirostris</i> (a)	X	—	—	X
Black-faced Cormorant, <i>Phalacrocorax fuscescens</i>	X	X	X	—
Silver Gull, <i>Larus novae-hollandiae</i>	X	X	X	X
Pacific Gull, <i>Larus pacificus</i>	X	X	—	X
Sooty Oyster-catcher, <i>Haematopus unicolor</i> (a)	X	X	—	X
White-faced Heron, <i>Notophyx novae-hollandiae</i>	X	X	—	—
Cape Barren Goose, <i>Cereopsis novae-hollandiae</i>	—	—	—	X
White-breasted Sea-Eagle, <i>Haliaeetus leucogaster</i>	X	X	X	—
Peregrine Falcon, <i>Falco peregrinus</i>	—	—	—	X
Brown Hawk, <i>Falco berigora</i>	X	—	X	—
Nankeen Kestrel, <i>Falco cenchroides</i>	X	X	X	—
Brush Bronzewing Pigeon, <i>Phaps elegans</i>	—	—	X	—
Bronze-Cuckoo yg., probably Horsfield, <i>Chalcites basal</i>	X	—	—	—
Fan-tailed Cuckoo, <i>Cacomantis flabelliformis</i>	X	—	—	—
Welcome Swallow, <i>Hirundo neoxena</i>	X	—	X	—
Tree-Martin, <i>Hylochelidon nigricans</i>	X	—	X	—
Grey Fantail, <i>Rhipidura flabellifera</i>	X	X	X	—
Flame Robin, <i>Petroica phoenicea</i>	X	X	X	—
Thornbill, probably Tasmanian, <i>Acanthiza ewingi</i>	X	X	X	—
Scrub-Wren, probably Brown, <i>Sericornis humilis</i>	X	X	X	—
Silvereye, <i>Zosterops lateralis</i>	X	X	X	—
Crescent Honeyeater, <i>Phylidonyris pyrrhoptera</i>	X	—	X	—
Pipit, <i>Anthus australis</i> (b)	X	—	X	X

Beautiful Firetail, <i>Zonaeginthus bellus</i>	X	—	—	—
Raven, probably Tasmanian, <i>Corvus tasmanicus</i>	X	—	—	—

Introduced Species (to Australia):

Blackbird, <i>Turdus merula</i> (c)	X	X	X	X
House Sparrow, <i>Passer domesticus</i>	—	—	X	—
Goldfinch, <i>Carduelis carduelis</i>	X	X	X	—
Greenfinch, <i>Chloris chloris</i> (c)	X	—	X	—
Starling, <i>Sturnus vulgaris</i>	X	—	X	—

Reference (a). Other members of the party with which I visited South West Island saw the Sooty Oystercatcher, Fairy Penguin, and chicks of the Mutton-bird.

Reference (b). The birds seen by me on Erith and Deal Islands were probably the Pipit, but I assumed the identification at each sighting, without taking care to identify positively. Only one bird was briefly seen by me on South West Island, without opportunity to identify positively. (The Pipit has been reported by others for the Kent Group, including collection of eggs by the 1890 party.) Occurrence of the European Skylark, *Alauda arvensis*, on the grasslands of Erith and Deal Islands is a possibility, if not now—then in the future. The Skylark has become abundant on Flinders Island since its first sighting there in 1928,⁷ greatly exceeding the indigenous Pipit which was recorded in 1912 as thinly distributed.⁸

Reference (c). I did not see or hear the Blackbird or Greenfinch on Deal Island. Mr. Clive Cocum (the then assistant lightkeeper) told me that both are seen frequently enough about the settlement area, close to East Cove.

Campbell's List

The only list of birds of the Kent Group published in a natural-history journal is that of A. J. Campbell. This appeared in 1891 as part of the report of the Victorian Field Naturalists' Club expedition to the Kent Group in the previous year.⁹

The list names fifty-four species, including a "Wattle Bird" species "reported having been seen by the lighthouse people" and identified by Campbell as being probably "*Acanthochaera inauris*" Yellow Wattlebird (*Anthochaera paradoxa*).

As the only list for reference, it has from 1891 to the present time been repeated or become usefully the base for private lists (notably that of J. H. and G. S. Hope, 1968), and thus has a status requiring appraisal after eighty years without revision.

Campbell's list includes twenty-three of the thirty-one species seen by me; the eight not in Campbell's list were White-faced Heron, Cape Barren Goose, Nankeen Kestrel, Blackbird, House Sparrow, Goldfinch, Greenfinch, Starling. Campbell's list should have included the House Sparrow, as the general report of the expedition states that two birds were seen near the lighthouse keeper's quarters, the only non-native species seen during the expedition. My list does not include thirty-one species in Campbell's list, as follows —

(The names used below are the 1926 RAOU Checklist¹⁰ accepted names for the species concerned, as some of the scientific names used by Campbell have been placed in synonymy, and some of the vernacular names have been changed.)

Brown Quail, *Synoicus ypsilophorus*
 Painted Quail, *Turnix varia*
 Fairy Prion, *Pachyptila turtur*
 Diving Petrel, *Pelecanoides urinatrix*.
 Black Cormorant, *Phalacrocorax carbo*
 Gannet, *Sula serrator*
 Spur-winged Plover,
Lobibyx novae-hollandiae
 Black Swan, *Chenopsis atrata*
 Black Duck, *Anas superciliosa*

Chestnut Teal, *Anas castanea*
Swamp-Harrier, *Circus approximans*
Goshawk, *Astur fasciatus*
Sparrowhawk, *Accipiter cirrocephalus*
Owl, *Ninox* sp.
Green Rosella, *Platycercus caledonicus*
Ground Parrot, *Pezoporus wallicus*
Sacred Kingfisher, *Halcyon sanctus*
Golden Bronze-Cuckoo,

Lamprocyx plagosus
Satin Flycatcher, *Myiagra cyanoleuca*
Golden Whistler,

Pachycephala pectoralis
Olive Whistler, *Pachycephala olivacea*
Black-faced Cuckoo-Shrike,

Coracina novae-hollandiae
Ground-Thrush, *Oreocincla lunulata*
White-browed Scrub-Wren,

Sericornis frontalis
Dusky Wood-Swallow,

Artamus cyanopterus
Striated Pardalote, *Pardalotus striatus*
White-naped Honeyeater,

Melithreptus lunatus
Tawny-crowned Honeyeater,

Gliciphila melanops
Yellow-winged Honeyeater,

Meliornis novae-hollandiae
Yellow Wattle-bird,

Anthochaera paradoxa
Black Currawong, *Strepera fuliginosa*

Unfortunately, the list and accompanying text (two articles, one by D. Le Souëf, leader of the expedition, the other by Campbell) are not reasonably complementary. Twenty-two of Campbell's listed species were not mentioned in the text, causing my doubt as to the actual sighting of some of the twenty-two species.

Six of the species not mentioned in the text as having been seen — Spur-winged Plover, Sparrowhawk, Ground Parrot, Sacred Kingfisher, *Fan-tailed Cuckoo, *Crescent Honeyeater — have a list notation "Skins seen", without mentioning in text or list, the collector, or when and where collected.

The other sixteen species not mentioned in the text do not have the "Skins seen" notation in the list, nor the other notation used in the list, "Eggs obtained" (which I have taken as being likely evidence that

each species so noted was seen). They are Brown Quail, Black Cormorant, *White-breasted (Black-faced) Cormorant, Gannet, *Silver Gull, Black Swan, Black Duck, Chestnut Teal, Swamp Harrier, *Ninox* sp., *Welcome Swallow, *Tree Martin, Dusky Wood-Swallow, Tawny-crowned Honey-eater, Yellow-winged Honeyeater, and the assumed Yellow Wattle-bird.

However, the six species marked with asterisk were seen by me, and six of the remaining sixteen have been accepted by me on report by others. These are the Spur-winged Plover, Yellow-winged Honeyeater, Dusky Wood-Swallow, Gannet, Black Cormorant and Black Swan. This leaves ten species for further inquiry — Brown Quail, Black Duck, Chestnut Teal, Swamp Harrier, Sparrowhawk, *Ninox* owl sp., Ground Parrot, Sacred Kingfisher, Tawny-crowned Honeyeater and Yellow Wattle-bird.

Other than the Ground Parrot and Yellow Wattle-bird the species just named "for further inquiry", probably occur at times in the Kent Group (mainly or entirely on Deal and Erith Islands), as each is in normal distribution north and south of Bass Strait and each except the Sacred Kingfisher (a seasonal migrant to Tasmania) occurs on Flinders Island.

Le Souëf's article on the 1890 expedition included the comment that on Erith Island the plant *Goodenia* flourished in some hollows and "it is the favourite feeding ground of the Swamp Parrakeet, but none were seen on this occasion". But I have not found in the main reference works a published record of sight of the Ground Parrot (Swamp Parrakeet) in the Group, and I have strong doubt that it has been collected there. Campbell, in his *Nests and Eggs of Australian*

Birds, published in 1900, nearly ten years after his Kent Group list, mentions Gould's sighting of the Ground Parrot on Flinders Island (now apparently extinct there), but makes no mention of the species being also in the Kent Group, as included in his own 1891 list.

I have not found any record of a Wattle-bird species for the Kent Group other than Campbell's mention of it, described earlier in this article. (I saw at long distance on Erith Island a flying bird that looked like the Red Wattle-bird, *Anthochaera carunculata*, but did not include the possibility in my list; the species has apparently not been recorded for Bass Strait islands or Tasmania.) The Yellow Wattle-bird and Little Wattle-bird, *A. chrysoptera*, were reported for Flinders Island by Le Souëf, 1902,¹¹ but Green⁷ in mentioning this also (by notation) classified the records as "doubtful and requiring more positive confirmation before inclusion in the list of local avifauna is justified".

Fourteen of the thirty-one species in Campbell's list not seen by me were mentioned in the text of the 1891 report as having been seen (some were also mentioned as being collected for specimens), or were included in the list with the notation "eggs obtained" and are thus assumed by me to have been seen. They were the Painted Quail, Fairy Prion, Diving Petrel, Goshawk, Green Rosella, Golden Bronze-Cuckoo, Satin Flycatcher, Golden Whistler, Olive Whistler, Black-faced Cuckoo-Shrike, Ground Thrush, Striated Pardalote, White-naped Honeyeater and Black Currawong. I gave close attention in suited areas on Deal Island for possible sighting of the Satin Flycatcher, Golden Whistler, Olive Whistler and Ground Thrush, but did not see any of those species in

the few hours occupied. All of the fourteen species have been recorded for Flinders Island (Green⁷) except the White-naped Honeyeater. For that species Green states "Campbell (1891) lists it from the Kent Group and White (1909) records it also on Deal Island. However, it is suggested that these authors may have mistakenly determined the somewhat similar *M. validirostris* or *M. affinis* for this species".

The two species are the Strong-billed Honeyeater and Black-headed Honeyeater, both of which occur on Flinders Island. Campbell claimed the White-naped Honeyeater, of which he collected a specimen, as a new record for Bass Strait islands, but this did not become accepted.

Campbell's list included two species of "Scrub-Tit" (now Scrub-Wren), one of which, the White-browed, *Sericornis frontalis*, a mainland species common in Victoria, he claimed in his article accompanying the 1891 list as a new species for the Kent Group. He maintained the claim in his *Nests and Eggs*, but with the modification proposed by W. V. Legge in 1896¹² (using Kent Group skins collected and provided by Campbell) that it be recognized as a subspecies of *S. frontalis*, with the name *S. f. gularis*. However, the proposal did not stand in twentieth-century taxonomy, and *gularis* became recognized as being *S. humilis*, the other Scrub-Wren included in Campbell's list, known then as Sombre-coloured Scrub-Tit, now as Brown Scrub-Wren. Thus occurrence of the White-browed Scrub-Wren in the Kent Group has now no official concurrence. It is ironical that Campbell in his *Nests and Eggs* described the "Geographical Distribution" of the Brown Scrub-Wren (the name used in *Nests and Eggs*) as "Tasmania, King Island and Furneaux Group", and

made no mention in the text that he had included the species in his 1891 Kent Group list.

I support the opinion of Dr. D. L. Serventy, in his description of speciation problems on Bass Strait islands (he provides ornithological examples, but not including *Sericornis*):

Obviously something interesting is happening in these isolated small populations and it would be of value if museums were to make collections of Passerines—and other terrestrial fauna—on these islands to document the phenomenon. Obviously, with the small populations involved it would be injudicious, from the conservation point of view, to collect too many individuals at the one time, but specimens should be 'harvested', as it were, by small gatherings at periodic intervals. In this way sufficiently large samples, statistically significant, could be accumulated for study.¹³

Other Sightings

The report⁶ by S. A. White of a brief visit to Deal Island in 1908 adds two species not included in the Campbell and Jones lists—

Hooded Dotterel, *Charadrius cucullatus*

Grey Shrike-Thrush, *Colluricincla harmonica*

Having expected to see the Hooded Dotterel, I described it at a camp gathering during my visit, and asked had it been seen. One person reported a bird, fitting the description of the black-headed male. It was seen on Erith's West Cove beach a few days before my arrival. The Hooded Dotterel and Grey Shrike-Thrush are breeding residents of Flinders Island.

Four more species that can be added with certainty to the Kent Group list are—

Crested Tern, *Sterna bergii*

Pied Oyster-catcher, *Haematopus ostralegus*

Wedge-tailed Eagle, *Uroaetus audax*

Barn Owl, *Tyto alba*

The Crested Tern and Pied Oyster-catcher were seen at Erith Island by several of the camp members at the 1969 visit. The Wedge-tailed Eagle "turns up" from time to time about Deal Island. I was told by Mr. Bob McNeill, head keeper of the lighthouse. It is a breeding resident of Flinders Island. Mr. Cocum described to me an owl that had died after a flight crash into a building when disturbed at a fuel heap where rats occur; the description fitted the Barn Owl, an identification also given to Mr. Cocum by a visitor who saw the carcass.

Three more species are included here as possibilities because of the circumstances of reporting—

Blue-winged Parrot, *Neophema chrysostoma*

Swift Parrot, *Lathamus discolor*

Black-and-white Fantail (Willie Wagtail), *Rhipidura leucophrys*.

Mr. McNeill described to me the occurrence from time to time, including that shortly before my visit, of small green-headed parrots, seen in grass areas along the vehicle track from the settlement to the lighthouse. He said they were similar in appearance to the "grass parrots" he knew in the Shepparton district of Victoria. The description suggested the Red-backed Parrot, which has not been recorded for the islands of Bass Strait or for Tasmania. The grass location does not suggest the Swift Parrot, *Lathamus discolor*, which occurs in Tasmania and Victoria and has been recorded for Flinders Island; Dr. Stephen Murray-Smith reported¹⁴ for Dover Island a small flock of parrots feeding in scrub, distinguished by red crowns and blue-tipped wings, which he identified tentatively as the Blue-winged Parrot, *Neophema chrysostoma*, but which I now consider were more likely to have been the

Swift Parrot. No *Neophema* species has been recorded for the Kent Group but R. H. Green informed me recently of unpublished records of sightings and a specimen of *N. chrysostoma* for Flinders Island, made since publication of his *Birds of Flinders Island*.⁷ Occurrence of the species in Victoria, Tasmania, King Island and Flinders Island indicates that the grass parrots seen by Mr. McNeill were Blue-Winged Parrots.

Mr. Cocom gave me a list of birds seen by a visitor to Deal Island, which included the Willie Wagtail, and I have included it here because the species has been recorded for Flinders Island, and because of Mattingley's interesting note of the species in flight over sea . . . "When close to Cliffy Isle a Willie Wagtail arrested our attention as it winged its way towards this isle."⁶

Other Possible Species for the Kent Group

There are several species that have not been reported for the Kent Group, but are likely to be added to the list if more frequent watching and reporting occurs. All of the species named below have been recorded at or adjacent to Flinders Island.⁷

The open seas and coastal waters are the most likely habitats for sighting of further species.

Attention to breeding on North East and South West Islands may add the White-faced Storm-Petrel, *Pelagodroma marina* (an egg collected on North East Island during the 1890 expedition was assumed to be of this species, but the species was not included in Campbell's list). Attention to other pelagic birds in passage among islands of the Group should add at least the Giant Petrel, *Macronectes giganteus*; Dove Prion, *Pachyptila desolata*; White-capped

Albatross, *Diomedea cauta*; and possibly the Black-browed Albatross, *D. melanophris*, and Southern Skua, *Catharacta skua*.

Species usually seen in coastal waters, bays and coves of Flinders Island, and thus likely for the Kent Group but not yet recorded, are the Australian Pelican, *Pelecanus conspicillatus*; Caspian Tern, *Hydroprogne caspia*; White-fronted Tern, *Sterna striata*; Fairy Tern, *S. nereis*; and Musk Duck, *Biziura lobata*.

Various of the small "waders" are a possibility in seasonal or brief occurrence on the shores of coves, including Turnstone, *Arenaria interpres*; Double-banded Dotterel, *Charadrius bicinctus*; Red-capped Dotterel, *C. alexandrinus*; Red-necked Stint, *Erolia ruficollis*; Sharp-tailed Sandpiper, *E. acuminata*.

Steady attention to watching and reporting of land birds on Deal, Erith and Dover Islands may add to the list of species, including Pallid Cuckoo, *Cuculus pallidus* (migrating across Bass Strait); and Strong-billed Honeyeater, *Melithreptus validirostris*, or Black-headed Honeyeater, *M. affinis*. It is likely, however, that practically all species of normal occurrence in grasslands and scrub of the Kent Group have been recorded.

Other Comments

Sea species — In my inexperience of watching birds at sea, the only species identified by me with certainty were White-capped Albatross and Short-tailed Shearwater (Mutton-bird), when "ketching" from and to Port Albert. Other species seen were probably Fairy Prion and Diving Petrel. I did not see Gannet or Caspian Tern, en route or at Kent Group. I found a small rookery of Mutton-bird on Erith Island, and was told there are a few small

rookeries on Deal Island; there are large rookeries on North East and South West Islands. The Fairy Penguin was attending to young on Erith Island, and I was told, breeds on all other islands of the Group. On South West Island I found wings at several places, apparently feeding spots for the four Peregrine Falcons seen there at our visit to the island; a specimen wing has been identified by Mr. Alan McEvey as that of *Pachyptila turtur*, the Fairy Prion. I also saw at South West a grebe-like bird, which I could not identify from the tossing ketch; it was possibly a Diving Petrel, which Mattingley, in his *Birds of the Hogans*, has stated "could be readily mistaken for a grebe under certain conditions . . ."⁶

About the Shores — The Silver Gull was the only species seen by me in any number, but not large. The four other species seen by me — Pacific Gull, Sooty Oystercatcher, Black-faced Cormorant, White-faced Heron — were all few in number. As mentioned above, a member of my party told me that before my arrival Crested Terns had been seen, not infrequently, co-habiting with Silver Gulls on the beach at West Cove; and another member reported a bird at West Cove the week before that matched my description to him of a male Hooded Dotterel.

"Large stuff" — This ranged in size from eagles to pigeons. One or two White-breasted Sea-Eagles were usually seen daily. (Mr. McNeill told me he has seen the Wedge-tailed Eagle over Deal Island "now and then".) I saw few Brown Hawk and Nankeen Kestrel, but they were dispersed over Erith and Deal, the Kestrel also being seen on Dover. The Peregrine Falcon was seen by me only on South West, and has been recorded for North East, and no doubt occurs also on Erith and

Deal. The Cape Barren Goose has been reported on all of the islands, but was seen by me (two birds) only on South West. A few Ravens were usually to be seen about West Cove. I did not see the Black Currawong. I was watchful for parrots, but saw only some covert feathers under thick scrub on Dover Island, later identified positively as being from the Green Rosella. I saw one only of Brush Bronzewing Pigeon, on Deal Island.

"Small stuff" — The native species most frequently seen were Grey Fantail, Flame Robin, Scrub-Wren, Thornbill, Silvereye and Beautiful Firetail, but none was numerous. The Scrub-Wren and Thornbill could not be identified by me with conviction, despite considerable watching, particularly of scrub-wrens in what appeared to be family parties, including birds in apparently juvenile plumage. I am guided by Green's description⁷ of identification problems, and his opinion that the Flinders Island species of scrub-wren and thornbill are the Tasmanian species, Brown Scrub-Wren, *Sericornis humilis*, and Tasmanian Thornbill, *Acanthiza ewingii*. I had two sightings in one area of Fan-tailed Cuckoo (probably the same bird); one sighting of a young cuckoo in flight calling for food from nearby Flame Robins, and identified by me then as Horsfield Bronze-Cuckoo; several sightings of a few Welcome Swallow and Tree-Martin; and two sightings of Crescent Honeyeater, each of one bird. I was watchful all the time in suited habitat for other species recorded for the Kent Group — Golden Bronze-Cuckoo, Satin Flycatcher, Golden Whistler, Olive Whistler, Grey Thrush (by S. A. White, 1908, not by Campbell), Black-faced Cuckoo - Shrike, Ground Thrush, Dusky Wood-Swallow, Striated Par-

dalote, White-naped Honeyeater, and Yellow-winged Honeyeater, but did not see any.

No information appears to exist concerning movement of migratory species (Sacred Kingfisher, the Cuckoos, Welcome Swallow, Tree Martin, Grey Fantail, Satin Flycatcher, Flame Robin, Dusky Wood-Swallow) and of nomadic species (Silvereye, possibly also Honeyeaters). Mr. Frank Gould of Port Albert told me that when he was engaged in professional fishing in Bass Strait he saw at times several Flame Robins flying north just above the water and appearing as though at any moment the birds would fall into the waves.

Non-Australian Species: The Blackbird appears to be not uncommon, and is dispersed over all of the Kent Group. Mattingley reported it at his 1938 visit to Deal Island, but no other non-native species. It was a surprise to me to find it on South West Island, six birds being flushed from one place in low vegetation. Matting-

ley found the Blackbird on similarly exposed Hogan Island, causing him to comment that it —

“... evidenced the fact that they are able to fly a considerable distance over the sea”.

The Starling was seen by me, mainly in one place, the Vale of Erith adjacent to West Cove; about a hundred birds or so judged by roosting flight. The Goldfinch was not uncommon on Erith and Deal, but I saw only two of the Greenfinch, on Erith; also a few House Sparrow, the latter about the lighthouse keepers' houses on Deal Island. Each of the five species, and also the Skylark, are breeding residents on Flinders Island.⁷ Some of the species appear to have been introduced by man to Flinders Island (the Blackbird about 1930⁷), but for the Kent Group the colonization of the five species appears to have been by natural distribution, unless introductions occurred through lighthouse staff.

* * *

WEATHER OBSERVATIONS AT ERITH ISLAND

In last year's report we described our continuous readings over twenty-eight days of temperature and relative humidity, analysed for us on a comparative basis by Dr. F. A. Berson. This year the meteorological effort was enlarged, and to our self-recording thermohygrograph (the “hermaphrodite”) we added a companion piece of equipment, in the shape of a Lambrecht wind recorder, Woelfle type (the “woofler”). This complex and expensive instrument consists of a cup anemometer system with vane, recording continuously on a clock-work driven waxed chart the direction of wind and the “run

of wind” (i.e. the speed of the wind multiplied by the time). No previous wind recording with an instrument of this sophistication has been carried out in the central region of Bass Strait.

Our thermohygrograph, the daily servicing of which was carried out with dedication by Malcolm Anderson, was again lent to us by the CSIRO Division of Meteorological Physics. The woofler was lent by the Commonwealth Bureau of Meteorology. It should be pointed out that the woofler is not designed to measure wind gusts, which was something of a disappointment to the

sensationally-minded amongst us, cowering at times from the cannon-like booms which heralded a particularly apocalyptic gust, and which had all but the strongest-nerved wondering how long canvas could stand it. The hermaphrodite did however perform one scientific function for which it was not designed: on Christmas Eve it gave us a measure of wind-gust strength when it was twice blown off its stand in our camp to land six feet away. It weighs eighteen pounds. After that it was firmly tied down.

The woofler was carried by a complaining party to the crest of One Tree Hill in the south-west of Erith Island. Here we erected the instrument above a sturdy metal pole, two metres in height and strongly stayed against gales and the incursions of wandering cattle. The site was chosen for a combination of altitude (about three hundred feet), absence of local obstructions and exposure to prevailing winds. Unfortunately difficulties of access from the camp, with a minor malfunction of the instrument, restricted the con-

tinuous recording period to twenty-five days.

Wind directions and speeds during a period as short as this are even less representative of the regime than temperature and humidity recordings. Nevertheless, a comparison can again be made with a mainland station such as Aspendale on the eastern littoral of Port Phillip Bay. Hourly mean values of direction and speed were formed for Erith Island and Aspendale, at the latter station from a Dines anemograph recording the wind at forty feet above sea level.

The wind-rose in the diagram shows the run of wind for sixteen points of the compass as a percentage of the totals, i.e. 8,579 nautical miles at Erith Island and 3,864 miles at Aspendale. The average wind strength at the island was thus more than twice as high as at the mainland station (the building effects at Aspendale, reducing the average speed, would not alter this factor significantly). The diagram demonstrates for Erith Island a strongly bi-modal distribution with regard to

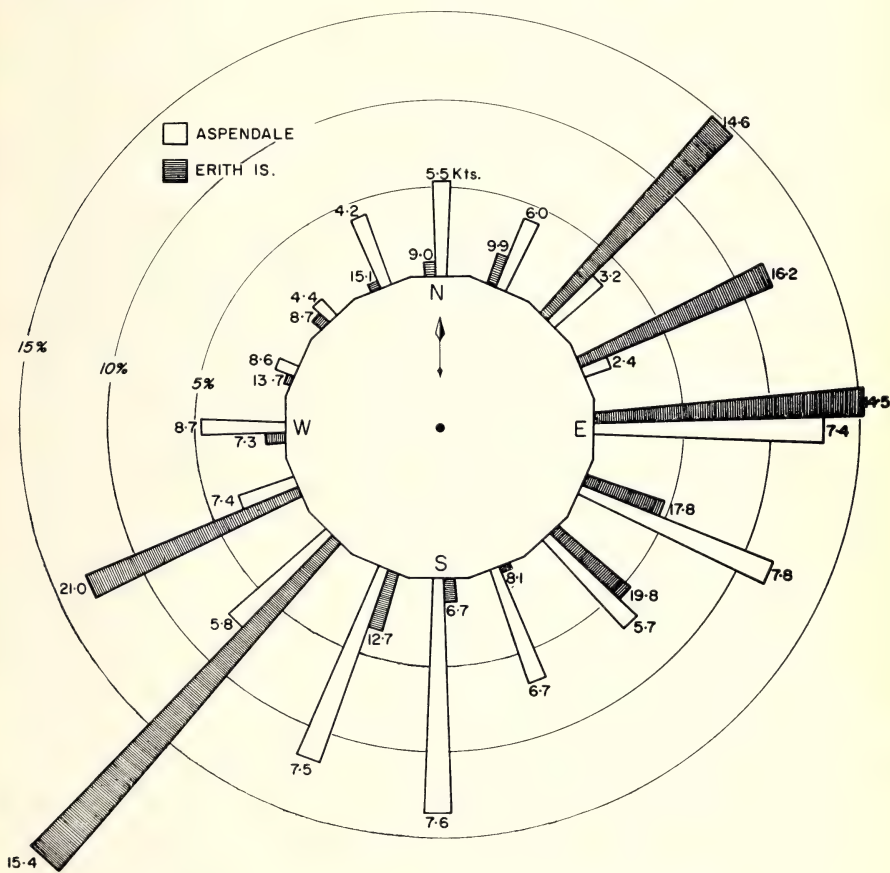


Erection of
"woofler", Erith
Island,
December 1969.

Photo:
M. A. Marginson.

direction: 51% of the total run of wind occurred with easterly winds (NE to SE direction) and 39% with winds from the SW quadrant, the remaining 11% being distributed fairly evenly among all other points of the compass. At Aspendale, about 60% form an arc extending from E through S to SW with no other preferred direction.

The numbers written at the end of the direction indicators give the mean wind speed associated with a given direction. As mentioned already, on the island the wind blew twice as hard on the *average*, but it is seen from the diagram that south-easterlies and south-westerlies were about three times stronger than at Aspendale. South-westerlies of



Direction and run of wind at Erith Island, Bass Strait, 27 December 1969-20 January 1970, compared with that at Aspendale, Victoria.

Length of spokes gives percentage of total run of wind for each direction (run of wind = speed by time). Figures represent the average windspeed in knots from the relevant direction.

Note the high average wind speeds associated with WSW and ENE winds, this diagram clearly showing the channelling effect of the orientation of Bass Strait on wind speed and direction.

this strength and persistence are unusual for the time of year and were caused by the passage across the region of a couple of depressions associated with vigorous cold fronts. It will be noted that the highest average speeds occurred with WSW and ENE winds, i.e. with directions paralleling the orientation of Bass Strait. This channelling effect of Bass Strait on air streams is of considerable importance to meteorologists and seafarers alike, and has not previously been directly observed in the Bass Strait sea-way.

The anomalous wind regime is also reflected in the temperature and humidity observations on both the island and the mainland. The average recorded daily maximum temperature during the present expedition period was 66.2°F at Erith Island and 72.9° at Aspendale. These values are 5.5° and 6.6° lower than in the comparable period of the previous expedition (30/12/68 to 26/1/69). The average minimum

temperatures were 56.3° and 54.6°, a decrease by 3.2° and 2.6°, respectively. The corresponding average daily temperature ranges of 9.9° and 18.3° were 2.7° and 4.0° smaller than in the previous period. It is remarkable how little these changes from January 1969 to January 1970 differ as between the two places.

As to the recorded relative humidities, the average values at 0900 hrs. (E.S.T. and T.S.T., respectively) during the previous expedition were 79% at the island, but only 49% at Aspendale. For the present period we prefer to compare the average daily minimum humidities. These were rather high, viz. 59% and 54% for the two stations, and their closeness clearly bears out the levelling effect of over-riding synoptic-scale influences in this recent period. Thus at Aspendale the average minimum humidity was even slightly higher in January 1970 than the average morning value in 1969.

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3. See, for instance, Geoffrey Blainey: *The Tyranny of Distance* (Melbourne, 1966), p. 115 ff.
4. *Ibid* p. 116.
5. Jeannette Hope: "Biogeography of the Mammals of the Islands of Bass Strait . . ." (Ph. D. thesis, Monash University, 1969), p. 93.
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11. *Victorian Naturalist*, Vol. 18, 1902.
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13. *Australian Natural History*, Vol. 15, 1967, pp. 405-6.
14. *Victorian Naturalist*, Vol. 84, 1967, p. 249.

APPENDIX I

In the course of the investigations reported in this paper twenty new botanical records were made for the Kent Group, three being new to Bass Strait. As before, we are most grateful to Mr. J. H. Willis, of the National Herbarium, Melbourne, for his identifications. We list here the new records.

- Stiff Rye-grass (*Lolium loliaeum*), Vale of Erith. (Naturalized plant.)
 Cocksfoot (*Dactylis glomerata*), Vale of Erith/Valley of the Noonflowers traverse. (Naturalized plant.)
 Soft Brome (*Bromus mollis*), Vale of Erith. (Naturalized plant.)
 Sterile Brome (*Bromus sterilis*), Vale of Erith. (Naturalized plant.) New to Bass Strait.
 Red-Top Bent (*Agrostis gigantea*), Vale of Erith/Valley of the Noonflowers traverse (Naturalized plant.) New to Bass Strait.
 Hares-tail (*Lagurus ovatus*), Vale of Erith/Valley of the Noonflowers traverse. (Naturalized plant.)
 Coast Saltbush (*Atriplex cinerea*), South West Island.
 Orache (*Atriplex hastata*), Vale of Erith/Valley of the Noonflowers traverse. (Naturalized plant.)
 Soft Cranesbill (*Geranium molle*), Vale of Erith. (Naturalized plant.)
 White Correa (*Correa alba*), South West Island.
 Giant Hop-bush (*Dodonaea viscosa*), Dover Island, near swashway.
 Nightshade (*Solanum nodiflorum*), Erith Island. (Naturalized plant.) New to Bass Strait.
 Bluebell (*Wahlenbergia quadrifida*), Vale of Erith/Valley of the Noonflowers traverse.
 Twiggy Daisy-bush (*Olearia ramulosa*), hill between Valley of the Noonflowers and Wallibi Cove, Erith Island.
 Flax-leaf Fleabane (*Conyza bonariensis*), Vale of Erith. (Naturalized plant.)
 Showy Cassinia (*Apalochlamys spectabilis*), Vale of Erith.
 Cotton Fireweed (*Senecio quadridentatus*), Vale of Erith/Valley of the Noonflowers traverse.
 Shrubby Fireweed (*Senecio minimus*), Erith Island.
 Shore Thistle (*Carduus tenuiflorus*), Vale of Erith/Valley of the Noonflowers traverse. (Naturalized plant.)
Thuidium furfurosum (moss), Erith Island.

APPENDIX II

We are grateful to Mr. Rex Filson, of the National Herbarium, Melbourne, for his identifications of the following lichens.

Dover Island

- Francis Cove to Phillpot Peak.
Teloschistes spinosa (Hook. f. & Tayl.) J. Murray.
Cladia aggregata (Sw.) Nyl.
Cladia retipora (Labill.) Nyl.
Cladia sullivanii (Mull. Arg.) Martin.
Cladonia alpestris (L.) Raben.
Cladonia sp. (unfertile).
Usnea sp. (too small).
Usnea flexilis Stirt.
Menegazzia circumsorediata R. Sant.

- Parmelia caperata* (L.) Ach.
Parmelia harrisii Kurok.
Parmelia sp. (possibly undescribed).

South West Island

- Teloschistes spinosa* (Hook. f. & Tayl.) J. Murray.
Teloschistes chrysophthalmus (L.) Th. Fr.
Xanthoria ectanea (Ach.) Ras. ex. R. Filson.
Ramalina ecklonii (Spreng.) Mey. & Flot.
Microthelia atterrима (Anzi) Zahlbr.
Parmelia caperata (L.) Ach.
Physcia sp. (non-fertile).
Lecanora sp. (possibly undescribed).

APPENDIX III

Plants collected on South West Island

Fifteen plants were collected, and we have divided them into four categories according to our notes of their occurrence. These categories could well be modified by further investigation. The categories are based on whether a plant occurred in

domains in which it was dominant (or co-dominant), or whether it did not occur in domains. Each of these categories is then split into two according to whether the occurrence outside domains was frequent or infrequent.

OCCURRING IN DOMAINS

Occurrence *Disphyma australe*
elsewhere (Rounded Noon-flower)
frequent *Poa poiformis*
 (Blue Tussock-grass)
Senecio
lautus subsp. *dissectifolius*
 (Variable Groundsel)
Rhagodia baccata
 (Seaberry Saltbush)

Occurrence *Atriplex cinerea*
elsewhere (Coast Saltbush)
infrequent *Lavatera arborea*
 (Tree Hollyhock)

NO DOMAINS FOUND

Crassula sieberiana
 (Austral Stonecrop)
Salicornia quinqueflora
 (Beaded Glasswort)
Bulbine bulbosa
 (Bulbine Lily)
Pelargonium australe
 (Austral Storksbill)
Alyxia buxifolia
 (Sea Box)
Correa alba
 (White Correa)
Tetragonia implexicoma
 (Bower Spinach)
Brachycome diversifolia var. *maritima*
 (Tall Daisy)
Lepidium foliosum
 (Coast Peppergrass)

APPENDIX IV

The following identifications of, 1970 have kindly been provided by and notes on, reptiles collected on Mr. Peter Rawlinson of La Trobe Erith and Dover Islands during the University. summers of 1963, 1967, 1969 and

REPTILIA SQUAMATA LACERTILIA

SCINCIDAE

White's Skink (*Egernia whitei*, Lacepede)
Erith Island (1).

Metallic Skink (*Leiolopisma metallicum*, O'Shaughnessy)
Dover Island (1); Erith Island (36).

Three-lined Skink (*Leiolopisma trilineatum*, Gray)
Dover Island (1); Erith Island (4).

Bougainville's Skink (*Lerista bougainvilli*, Gray)
Dover Island (1).

OPHIDIA

ELAPIDAE

White-lipped Snake (*Denisonia coronoides*, Gunther)
Erith Island (2).

It may be noted that the five species above have also been collected by me on Deal Island, together with an additional species not yet found on Erith and Dover Islands, the Southern Bluetongue lizard (*Tiliqua nigrolutea*).

All specimens have been catalogued into the University of Melbourne Zoology Department reptile collection, and will ultimately be lodged in the collection of the National Museum of Victoria.

The five species collected are widely distributed in the Bass Strait area, and all are shared with southern Victoria, most of the eastern Bass Strait Islands and Tasmania. Perhaps the most noteworthy feature of the reptile fauna is that none of

the probable southern Victorian post-glacial intrusives (see Rawlinson 1967) have been recorded. This indicates that the reptile fauna of the Kent Group was derived from the same source as the present day Tasmania reptile fauna.

REFERENCE

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The Pollination of *Corybas diemenicus* (H.M.R.) Rupp and W. H. Nicholls ex H.M.R. Rupp

by

DAVID L. JONES

In September 1969 while examining flowering plants of *Corybas diemenicus* at Mount Morton, Victoria, I came across a tragedy of nature which I believe gives an important insight into the pollination of this orchid. One flower had a small insect on the labellum, with a pollinarium securely attached to its thorax. It was apparently the pollinating agent of the orchid and appeared to be dead. After a cursory glance, I popped the flower containing the insect into a bottle for closer scrutiny at home.

Some few hours later while examining the flower under a microscope, the full tragedy was revealed. The insect was securely entrapped in a tiny web on the surface of the labellum by a rear tarsal segment. Because it fitted neatly into the confined space there was very little room to manoeuvre. It had apparently struggled vigorously, but to no avail; for its wings were quite tattered. The predator had not returned to consume its victim, since apart from the damaged wings the body was in perfect condition.

The fact that the pollinarium attached to its back was in good order seemed to indicate that the insect had not been dead for very long.

After noting the insect's position relative to the column and labellum, I carefully extracted it from the flower. It was then measured, sketched and sent to the National Museum where it was identified by A. Neboiss as a member of the family Mycetophilidae or Fungus Gnats. Unfortunately this is as far as the identifica-

tion could be taken since the family is a complex one badly in need of revision.

The family Mycetophilidae belongs to the order Diptera or two-winged flies. Its members are delicate, slender little gnats found in shady moist places. Many species breed in fungi but generally the life cycle is incompletely known. Flies of the family characteristically have a humped thorax and long antennae. They are separated into species, mainly on the characters of the antennae and wing-venation.

In Australia they seem to be very important in the pollination of galeate orchids. They have been previously reported^{1, 2}, and I have made further observations in their role in other species. These will be dealt with more fully in a future article.

The species found on the *Corybas* labellum measured approximately 4 mm. long. It was quite dark and with the typical "hunchback" look to the thorax. The perfect adaptation of this gnat to pollination in confined spaces can be readily seen from the drawing. Its slender build enables it to manoeuvre in the cramped areas where it works. Also, whilst the insect is feeding the "hunchback" thorax is in the perfect position to pick up and deposit pollinia.

As there may be some doubt that this insect was associated with the pollination of *Corybas diemenicus* I made a careful examination of the pollinarium of its thorax. Comparisons with fresh pollinaria showed that it was identical, and undoubtedly from a flower of *C. diemenicus*. I have no doubt that the insect I found

is associated with the pollination of this orchid.

The mechanism adopted by the orchid to ensure cross pollination seems simple and relatively ineffective considering the small number of swollen ovaries one sees on this species.

Mycetophilids and other micro-dipterans seem to be attracted to decaying smells³, and it is possible that this orchid emits such a scent. I was not able to observe any behavioural details of the insect since it was dead when I found it, and also, I have not been able to determine any scent from the orchid. This of course does not rule out such a perfume which may be imperceptible to us, but attractive to the gnats. In fact it is quite probable that such an attraction does exist since the orchid is so inconspicuous.

A second attraction is possibly provided by nectar. There appears to be two small glands situated on each side of the base of the column which may be nectaries or even scent-glands. These seem to be quite moist and supply fluid without puncture. E. Coleman reported a projection just below the stigma in *C. aconitiflorus* Salisb. which supplies nectar after puncture⁴. In *C. diemenicus* there is a similar projection. However, liquid oozes from any surface of the column after puncture and it does not appear to be nectar. It is probable that if nectar is present it serves as an enticement and a reward after the insect has entered the flower.

Flowers pollinated by flies are termed Myophilous. A separate division has been coined for those species which lure dipterans with scents of decaying materials or carrion. These are termed Sapromyophilous. An overall picture has been established for Sapromyophilous species⁵, and it is probable from certain characteris-

tics of *Corybas diemenicus* that it is a member of this group. These characteristics are:

- I Flower inconspicuous.
- II Colour dull or greenish, occasionally augmented by a brown-purple.
- III No nectar-guides.
- IV The presence of the peculiar openings or auricles at the base of the labellum.
- V The presence of an entrapping mechanism on the labellum.

As in all orchids the labellum of *C. diemenicus* plays the dominating role in its pollination.

As the flower matures, relative movements of the labellum and dorsal sepal occur. At the time when the pollen and stigma are ripe, these organs are in a position to allow the entry of insects attracted to the flower.

At the base of the labellum the surface is convoluted to form two small auricles. These are sited so that they form a direct connection with the interior-base of the flower and the outside environment. Their role has been somewhat conjectural, but I am of the opinion that they are a direct aid to pollination. Firstly they probably allow some small amount of light to penetrate into the interior of a flower, which because of its shape and habitat, would be pretty gloomy. Secondly however, and this is probably the more important factor, it would allow some small air current to circulate. Such a current, no matter how small, would probably be of extreme importance in the diffusion of the attracting scent to the outside environment. It is perhaps significant that the two small glands are situated near the opening of the auricles.

A microscopic examination of the surface of the labellum reveals a

wonderful adaptation in the form of a well-hidden trap. On the throat at the point where the gradient becomes steepest, there are a series of cunningly-placed downward sloping teeth. These are quite round and slender and would offer no restriction to an insect moving forward, while they would tend to prevent it backing out easily once it reaches this point. By going forward, perhaps feeding on the nectar, and then using the column to manoeuvre, the insect could quite easily get out of the flower again, and perhaps in the process bring about pollination.

From some of these remarks we can see that along with many of

our orchids, the dour little *Corybas diemenicus* has developed quite a remarkable pollination relationship, although observations suggest it may not be as effective as some.

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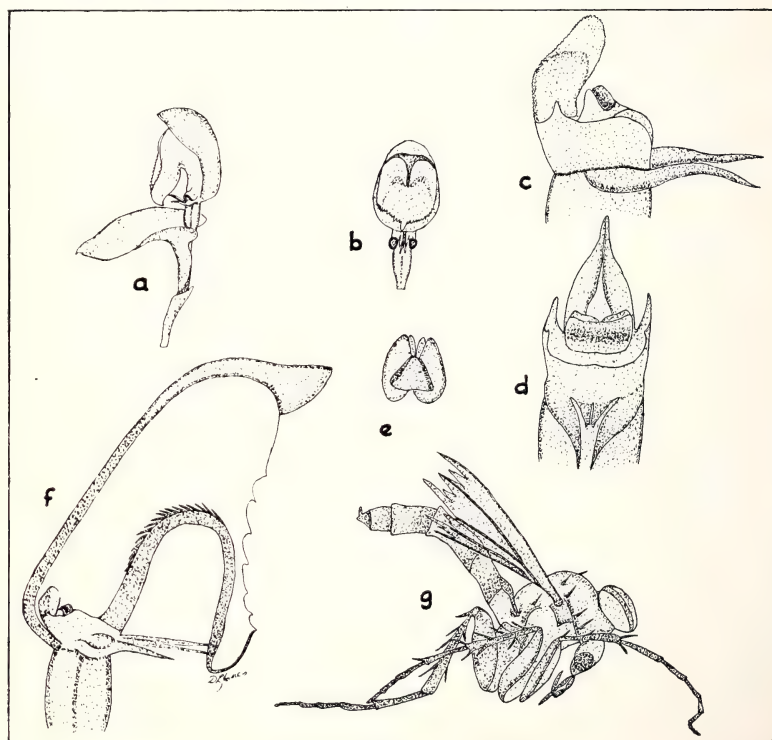


Fig. 1

- | | |
|---|---|
| (a) Plant from side ($1\frac{1}{2}$ x). | from front (40 x). |
| (b) Flower from front ($1\frac{1}{2}$ x). | (e) Pollinarium (40 x). |
| (c) Column and lateral sepals from side (40 x). | (f) Section of Flower (6 x). |
| (d) Column, lateral petals and sepals | (g) Pollinating agent showing attachment of pollinarium (25 x). |

book review

The Wild Flowers of the Wilson's Promontory National Park

Published by Thomas C. Lothian Pty. Ltd. in conjunction with the
Field Naturalists Club of Victoria.

Size 8 $\frac{3}{4}$ " x 5 $\frac{3}{4}$ ", stiff cover, vii + 220 pp., with glossary and index. Five well-known wildflower photographers (Dr. G. N. Christensen, Mrs. Ilma Dunn, Miss Betty Terrell, Mrs. J. R. Garnet and the late H. T. Reeves) have added to the charm and usefulness of the illustrations by contributing their superb photographs for the preparation of the 9 colour plates and 32 half-tone illustrations. These, with the author's line drawings, make possible the easy identification of more than one quarter of the 740 native species of fern and flowering plant recorded as inhabiting the National Park.

In conformity with the pattern established in his earlier book on the Vegetation of Wyperfeld National Park, the author has recorded the known flora of the Promontory in the form of check-lists. In this book he has extended the range beyond the vascular flora to include mosses, lichens, liverworts, fungi and marine and freshwater algs.

The check-lists are something more than mere catalogues of species. Together with the general text they provide fascinating glimpses into the past history of the Promontory.

The Field Naturalists Club of Victoria is proud to be associated with the publishing of this attractive volume, not only because the author is one of its members, its one-time honorary secretary and, on two occasions, its President but, because the Club itself played an active part in bringing about the establishment of this famous national park. Members of the Club have been responsible for much of its recorded natural history and this book brings together under one cover the combined results of their botanical contributions.

Don't for a moment think that the book is designed exclusively for botanists and those with some special interest in wildflowers. It is written for the pleasure and enjoyment of any one of the 90,000 people who visited the Park last year and any one of the thousands who will visit it this year and in future years.

Even those who can't endure the sight of wildflowers will enjoy reading what the author has to say about the "Prom."

About the author: The striking dust jacket gives a brief biographical sketch of the author and Who's Who in Australia adds to it by mentioning that one of his recreations is "going bush". To all this we need scarcely add that his talent for botanical illustration is displayed to advantage in this present book — which is a tribute to both the illustrator and the process block maker.

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Field Naturalists Club of Victoria

The F.N.C.V. Council members and the Editor wish to extend the Compliments of the Season to all readers; and we also hope that 1971 offers the opportunity for the fulfilment of our ambitions.

General Meeting

9 November, 1970

The President, Mr. T. Sault, chaired the meeting and made welcome approximately 120 members and visitors, including some from the country.

Mr. Barry Cooper asked members to come forward and speak about their exhibits, a varied collection being tabled.

Exhibits:

Barry Cooper — Collection of Fossil Echinoids (Sea Urchins) from Vic. beaches.

S. Barker — Acacia galls (Scale insects).

N. E. Hall — Mahogany Gum leaves affected by filigree lerps (under microscope).

Mrs. E. King — *Banksia marginata*, *Sprengelia incarnata*, *Helichrysum* spp. Mountain pepper (*Drimys lanceolata*), distorted Manuka trunk (*Leptospermum juniperinum*) from Tasmania.

Mrs. Jean Zirkler — Mealy Bug (Lerp insect).

Miss Doery — Wiry Bauera (*B. rubioides*), Pinnate Boronia (*B. pinnata*) Large-leaved Grevillea (*G. barkleyana*), Blue Dampiera (*D. stricta*). Collected by Native Plants Preservation Society on areas being bulldozed at Labertouche.

Mrs. W. Seamons — Tufted Blue Lily (*Stypandra caespitosa*) Melaleuca (*M. decussata*).

Mr. I. Hammett — False Wattle (*Calicoma seratifolia*), *Olearia* spp. from Kinglake area, Lemon Bottle-brush (*Callistemon pallidus*), *Melaleuca* (*M. filifolia*), Spiny Tea-tree (*Letospermum spinescens*).

Mr. A. J. Swaby — A collection of mosses and miniature plants.

Mr. T. Sault — Rushes and Sedges and pond life under microscope.

Mr. K. Strong — Gall insect hatched from specimen shown by Mr. Cameron at previous meeting.

Also tabled were the dustjacket of "Wildflowers of Wilson's Promontory" by J. Ros Garnet available at Christmas and a poster concerning the proposed site of the Natural History Museum — is it to be used for other purposes?

The presentation of the Natural History Medallion to Miss Jean Galbraith, was made by Mr. R. T. M. Pescott who said that Miss Galbraith was most deserving of the award. The Medallion is awarded to people of merit in the Natural History field and Miss Galbraith was most ably qualified by her excellent ability as a writer and lecturer, being the author of numerous articles and several books, notably "Garden in a Valley" and "Wildflowers of Victoria". Miss Galbraith on accepting the Medallion paid a tribute to all those people who had helped to widen her knowledge of natural history. She had become a member of the F.N.C.V. in 1921 and had received much help and inspiration from members over the years.

Mr. T. Sault after thanking Mr. Pescott for presenting the award, presented Miss Galbraith with her Honorary Membership Certificate, much overdue, as she had been made an honorary member 11 years ago.

Mr. David Reeves of Riddells Creek, Secretary of the Macedon Range Conservation Society, issued an invitation to members to assist with a Koala survey to be conducted in the Macedon area on Nov. 22nd.

The Secretary announced that Mr. Rex Filson had been awarded a Churchill Scholarship enabling him to further his studies on lichens overseas.

A letter was received from Mr. L. K. Elmore with further information on the Mt. Napier National Park and enclosing maps of the area.

Mr. J. Baynes queried the new postage charges for the Vic. Naturalist. This was discussed by members and the President stated that this matter was being investigated by the Council.

Mr. G. Taylor drew members' attention to the continuing threat of alienation of the Westernport Bay areas by proposed development of heavy industries. There were also indications of further works by the C.R.B. in East Gippsland in areas which should be preserved. He appealed to members for vigilance on these matters.

It was with deep regret that the President announced the deaths of 3 club members. They were Mr. Ernest E. Lord, Miss Chisholm and Miss F. Bage. Members were also informed of the death of Mrs. N. E. Lewis, club subscription secretary for the past 2 years.

Mr. A. Fairhall paid a tribute to Mr. Lord, a past Treasurer and President of the Club. He was the author of "Trees and Shrubs for Aust. Gardens" and was the founder and first Editor of the magazine "Your Garden".

Mrs. Bennett, speaking of Miss Chisholm, said that she was a member since 1918 and had wide interests in natural history. She resided at Mt. Macedon until her recent transfer to the Alexandra Home at Castlemaine.

Mr. J. Baynes spoke of Miss Bage's long association with the club, being a member since 1904. She was a highly qualified and distinguished member.

Mr. D. Lee said that the death of Mrs. Lewis was a tragedy as she was a young and vivacious woman and had been a very efficient subscription secretary. Mr. D. McInness had taken over the books and Mr. D. Lee had with-

drawn his resignation temporarily until other arrangements could be made.

Those members who visited Wyperfeld National Park earlier this year would be saddened to hear of the death of Mr. R. Campbell, park ranger, who was of great assistance to them during their stay.

Miss Jean Galbraith was guest speaker for the evening and her address was entitled "Enjoying Life". She spoke of her philosophy of life which could be understood and appreciated by all naturalists. Miss Galbraith said that there were many things that could be enjoyed in the study of flowers and their methods of pollination, the reasons for leaves being of different shapes and sizes, and the great complexities of plants of the same family. She also said that children should be introduced to natural history at an early age and an appreciation of nature ensured that they would be the conservationists of the future. Amongst plants there was intense competition as well as co-operation, but she had found it a restful world without pain and gave enjoyment to all who seek to know its many facets. We depend on plants for our daily bread and our daily ration of beauty.

Mr. Sault thanked Miss Galbraith for her stimulating and thought provoking talk, which was enjoyed by all present.

Botany Group Meeting

12 November, 1970

Miss Helen Aston spoke in her usual competent manner to the seventeen members and visitors present at the meeting. Her subject was "Botanical Terms". From the number of questions asked during Miss Aston's explanation of the list of common terms she had prepared for each member, it was obvious that her talk was much appreciated. She promised to come again some time next year to continue with the same subject.

There will be no Botany Group Excursion till next February.

Flowers and Plants of Victoria in Colour

Copies of this excellent book are still available, and of course would make a wonderful gift. They are obtainable from the F.N.C.V Treasurer, Mr. D. McInnes.

F.N.C.V. DIARY OF COMING EVENTS

GENERAL MEETINGS

Monday, 14 December — At National Herbarium, The Domain, South Yarra, commencing at 8 p.m.

1. Minutes, Reports, Announcements.
2. Nature Notes and Exhibits.
3. Subject for the evening — "Museology 70": The Function and Role of Museums in Society—Mr. J. McNally, Director of Natl. Museum of Victoria.
4. New Members.

Ordinary:

Miss Dorothy M. Lyons, 17 Hotham St., Seddon, 3011. (Interest—Geology.)
Dr. G. R. Wagner, 24 Highfield Rd., Canterbury, 3126. (Interests—Botany and Geology.)
Mrs. Anne E. Macaulay, 2/12 Station St., E. Kew, 3102.
Mrs. Margaret A. Watts, 96 Ludstone St., Hampton, 3188. (Interests—Botany and Ornithology.)
Mr. Roger Martin, 2/619 Bourke Rd., Hawthorn E., 3123.
Miss Mary E. Foster, 15 Nyora St., East Malvern, 3145. (Interest—Marsupials.)
Miss Irene H. Stewart, 189 New St., Middle Brighton, 3186.
Mr. G. Y. Stringer, "Tulloch" Officer, 3809. (Interests—Botany and Horticulture.)
Mr. G. L. Rayment, 14 Benwerrin Road, Surrey Hills, 3127. (Interest—General.)
Mr. Gregory C. Thwaites, 21 Pakenham Road, Ashburton, 3147. (Interest—Wildlife.)

Joint:

Mr. Eric and Rowena Whiting, 10/107 Gordon St., Footscray, 3011. (Interests—Geology and Botany.)

Junior:

Miss Janet Webb, 72 Were St., Brighton, 3186.

Country:

Rev. A. Eames, Sacred Heart Presbytery, P.O. Box 61, Yea, 3717.

5. General Business.
6. Correspondence.

Monday, 11 January, 1971 — Members' Night.

GROUP MEETINGS

There will be no Group Meetings between the December and January General Meetings.

F.N.C.V. EXCURSIONS

Saturday, 26 December- Sunday, 3 January. Cann River. The coach will leave Flinders St. outside the Gas and Fuel Corporation at 8.30 a.m. Boxing Day. Bring a picnic lunch.

GEOLOGY GROUP EXCURSIONS

Sunday, 7 February — Maribyrnong River Terraces—upstream from railway bridge, Albion-Broadmeadows Line. Leader: Mr. D. McInnes.

Sunday, 14 March — To Bulla-Deep Creek Gorge. Transport by private car. Spare seats are usually available for those without their own transport. Excursions leave from the western end of Flinders Street Station, opposite the C.T.A. Building at 9.30 a.m.

No excursion is planned for January, 1971.



Magnificent stand of White Mountain Ash, *Eucalyptus regnans*, in the Marysville State Forest

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MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available, and other activities are indicated in reports set out in the several preceding pages of this magazine.

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Ordinary Members	\$7.00
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Joint Members	\$2.00
Junior Members	\$2.00
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